

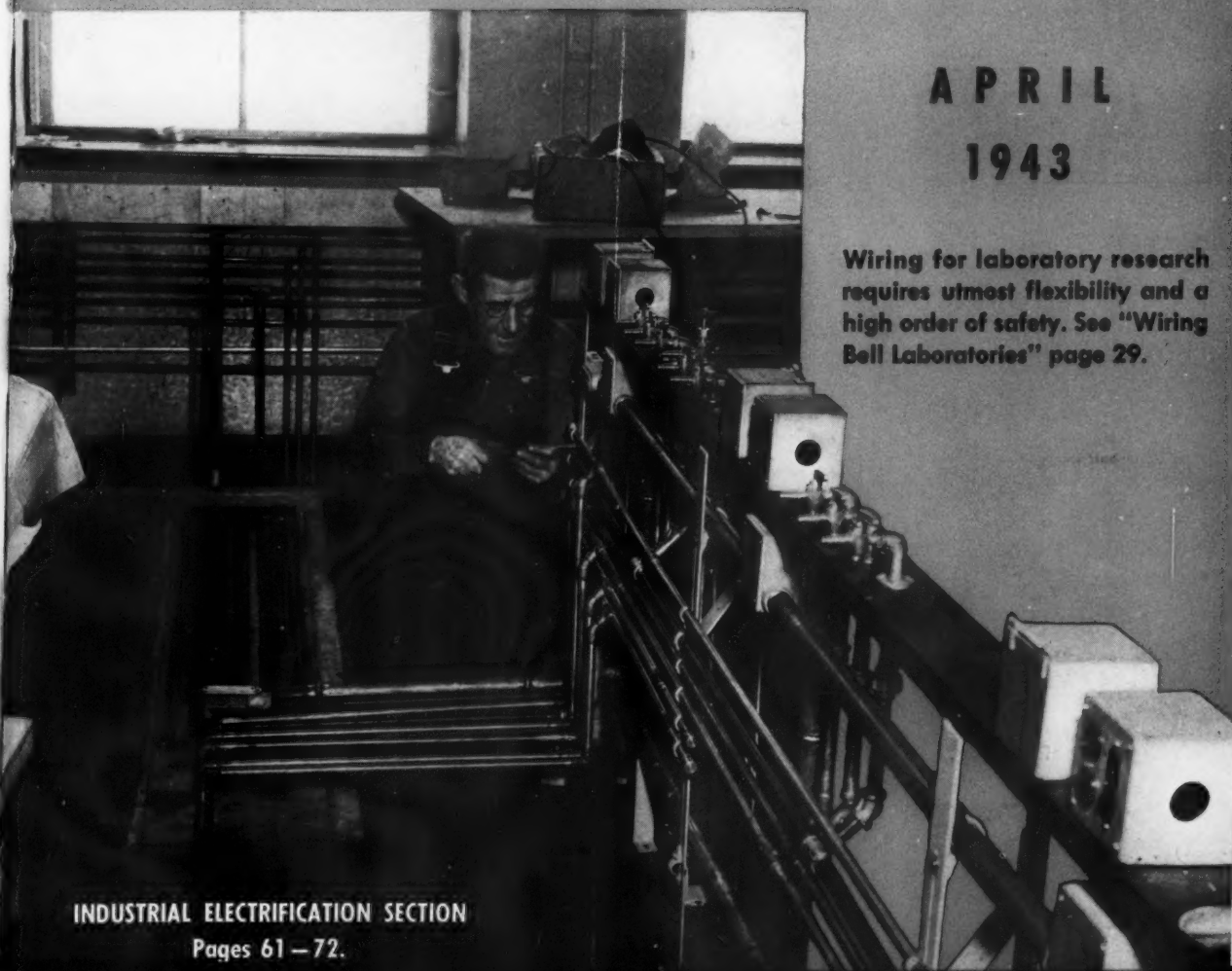
# Electrical Contracting

*The Magazine of*

ELECTRICAL CONSTRUCTION AND MAINTENANCE

APRIL  
1943

Wiring for laboratory research requires utmost flexibility and a high order of safety. See "Wiring Bell Laboratories" page 29.



INDUSTRIAL ELECTRIFICATION SECTION

Pages 61-72.



"Too bad for me all right, if they keep giving me the go-by with the oil can. Another day or two and—war or no war—I'm going to quit!"

"Can't really blame Joe for it either. With all the extra work he's been doing over in the annex, he had to cut down somewhere, I suppose."

"Brrrr—here come the 'shakes' again, all on account of that loose bolt in the base plate. If only I could holler 'Uncle,' instead of just sitting here battering my bearings out."

"Funny how people are. After I pass out tomorrow there'll be a regular clinic around here. Once I'm a 'has-been,' I'll be the most important motor in the shop."

# Preventive Care of Motors

... IS A MANAGEMENT PROBLEM

HERE'S HOW G.E. CAN HELP YOU SOLVE IT

A regular schedule for oiling, cleaning, and inspection of every motor is half the battle in keeping motors fit.

The G-E booklet "How to Care for Motors" tells what to do and when to do it. You can use it as a basis for issuing definite instructions, and for analyzing the hours of work involved so that your maintenance crews can be adequately staffed. Ask for GEA-2856A.



To get the most out of motors, and to meet new WPB requirements, the required horsepower for every job must be accurately known. On metal-cutting operations, the new G-E MOTORULE is just what you need to determine your requirements. Simple to use, it saves time and saves motor horsepower. Ask for GEL-763.



Free G-E Motor Record Cards (GES-1526A) make it easy to keep a convenient record of the specifications and service history of every motor in your plant.



General Electric, Sec. J 750-208, Schenectady, N. Y.

Yes, please send me:

- ☐ "How to Care for Motors" (GEA-2856A)
- ☐ G-E MOTORULE (GEL-763)
- ☐ A supply of Motor Record Cards (GES-1526A)

Name.....

Company.....

Address.....

City.....

State.....

BUILDER OF TRI/CLAD MOTORS

**GENERAL ELECTRIC**



**"WE BUY 'EM FOR  
SERVICING  
FLUORESCENTS—  
—and now every  
mechanic grabs 'em!"**

Such FLEXIBILITY in REACH,  
HEIGHT and MOBILITY makes  
this the SAFEST, FASTEST  
MAINTENANCE LADDER  
ever known

**You** tell us the height and side-ways  
reach you need and your minimum  
aisle width—then we'll come back  
with data on the *one* ladder that will  
do the safest, fastest, most satisfying  
service that money can buy. Relamp-  
ing need not interfere with produc-  
tion. Metropolitan Device Corpora-  
tion, Brooklyn, N. Y.

*Send  
for the  
full story  
in pictures  
!*

**METROPOLITAN DEVICE  
CORPORATION  
Brooklyn, N. Y.**

Send me data (without obligation) on the Murray  
Crow'snest best suitable for our requirements. Our  
ladder must reach \_\_\_\_\_ feet high and extend \_\_\_\_\_ feet  
side-ways. Aisle width is \_\_\_\_\_ feet.

NAME and TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

**Murray  
crow'snest**

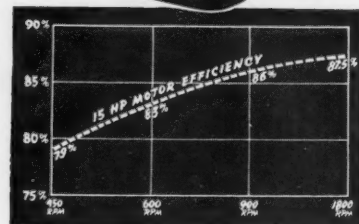
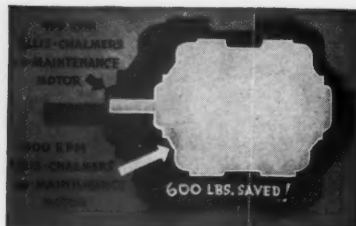
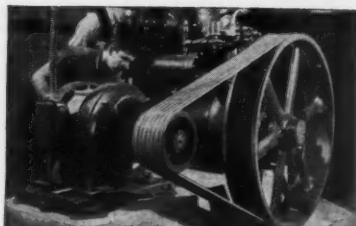
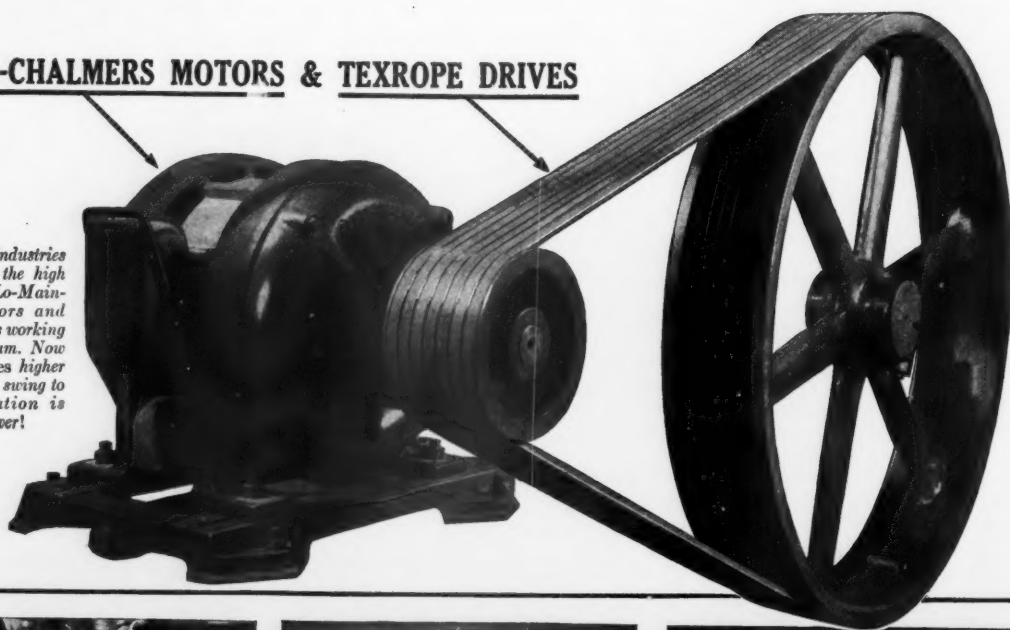
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**IN PEACE  
AND WAR..**

# Give this an "E" for

## ALLIS-CHALMERS MOTORS & TEXROPE DRIVES

*Thousands of industries already know the high efficiency of Lo-Maintenance Motors and Texrope Drives working together as a team. Now that war forces higher efficiencies, the swing to this combination is stronger than ever!*



**1** In most applications, an 1800 rpm motor with Texrope Drive will ably do the job of a lower-speed, direct-connected motor—at lower cost in money and materials!

**2** When you buy an 1800 rpm instead of 450 rpm 15 hp squirrel-cage motor, for example, 600 lb are saved. And you save well over \$200—with drive figured in!

**3** Note that efficiency rises from 79% for the 450 rpm motor to 87.5% for the 1800 rpm motor. The 1800 rpm motor saves you over 30 kw/24 hr. day.



# ALLIS-

# s Combination r Efficiency!

➡ Using high-speed motors with Allis-Chalmers Texrope Drives and single-speed motors with Allis-Chalmers Vari-Pitch Sheaves and Speed Changers has always been good practice. Today it's a vital practice!

➡ Such combinations give sharply higher efficiencies — at lower cost in man-hours, money and materials!

➡ As America's only builder of both motors and V-belt drives, Allis-Chalmers has long studied and advocated their use in proper combination.

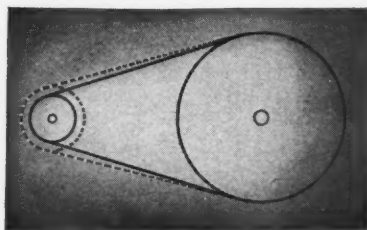
➡ Today you benefit from Allis-Chalmers pioneering when you ask for — and get — the right combination of Lo-Maintenance Motor and Texrope Drive!

**B**UILDING the largest variety of capital goods in the world, Allis-Chalmers know-how is in many ways unique — and is *completely* at the service of American war industry.

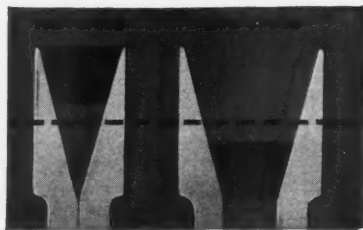
Allis-Chalmers, builder of Lo-Maintenance Motors, *originated* the multiple V-belt drive and Vari-Pitch Sheaves.

Today there's every patriotic *and business* reason for using material-saving, money-saving single speed and high-speed motors — made flexible and more efficient by Texrope Drives.

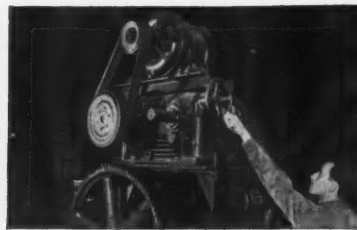
Don't hesitate to call on Allis-Chalmers district offices for engineering data or recommendations — or write direct to ALLIS-CHALMERS MFG. CO., MILWAUKEE, WISCONSIN. A 1581



**4** Infrequently needed speed changes can be had by changing from one size motor sheave to another. Juggling *complete* drives, range is 1:1 to 7:1.



**5** With the Allis-Chalmers Vari-Pitch Sheave, you can increase or decrease speed by adjusting sheave diameter . . . obtaining an *unbroken* series of speeds!



**6** Allis-Chalmers Vari-Pitch Speed Changer gives you infinite changes at the turn of a wheel — within 3.75 to 1. It's compact, flexible, *efficient!*

# S- CHALMERS

**LO-MAINTENANCE MOTORS  
TEXROPE DRIVES**



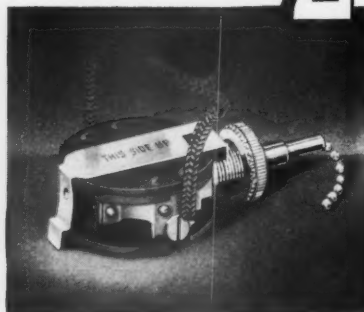


**WIRES** as easy as

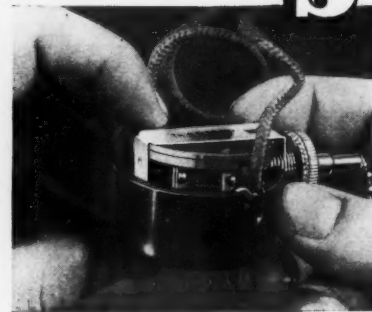
**1**



**2**



**3**



- Now, a new development of the Levolver No. 1010 Switches makes them simpler to wire. The new Bakelite casing allows mechanism to be lifted out with easy finger movements. No tool required. Thus, convenience is added to dependability.
- Dependability is as before. Rated 10-ampere 125 volt, it has a special "T" rating, showing that in addition to standard Underwriters' tests, it has had 12,000 more pulls on a load cold, high wattage, type C lamp with initial amperage surge of 80 amps; eight times its rated capacity.
- The finest of electrical equipment is no more dependable than the switch which operates it. That fact, and that alone, is why Levolver Switches have become a standard in the measurement of function. And the new No. 1010 adds convenience to its other dependable features.

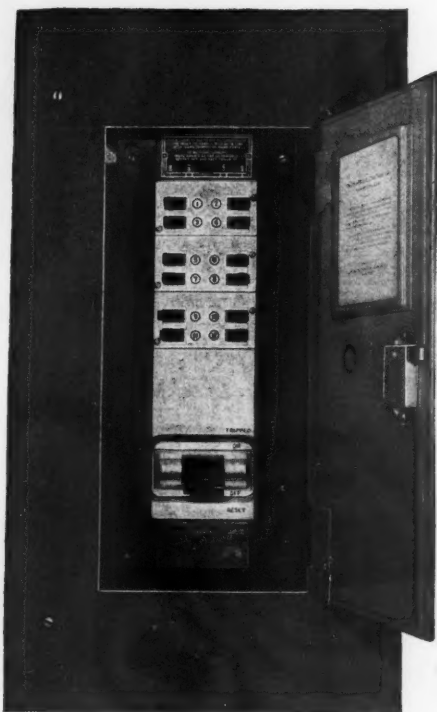
ELECTRICAL DIVISION

**McGILL MANUFACTURING COMPANY, INC.**  
VALPARAISO, INDIANA

# light is in the fight

USE IT FREELY...

GUARD IT WELL...



with **TRUMBULL** multi-breaker panels

Good lighting for the man at machine and desk is so necessary that distribution and control equipment is now a matter of first consideration by management.

Flexibility of the distributing means... provision for easy expansion of circuits, as conditions necessitate... simple, trouble-free control and positive protection are all requirements of modern lighting systems.

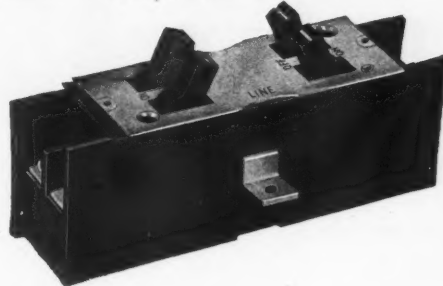
Trumbull Type NM1B Multi-Breaker lighting panels meet these conditions in every respect... at low cost... and with time-tested Circuit Breaker units which require no fuses, nothing to replace. Service, interrupted by overload, may be restored "at the flip of a switch". Moreover, use of critical materials is held to a minimum.

Note the valuable features which make Multi-Breaker the ideal panel for industrial lighting systems.

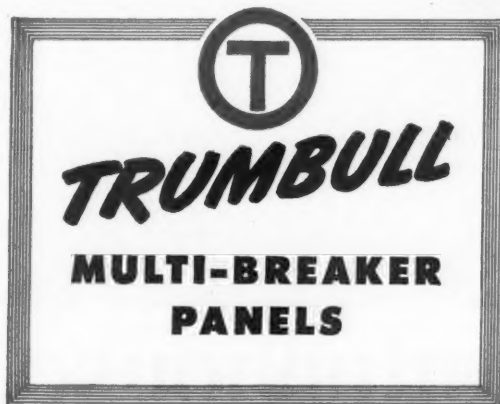
**EASILY INSTALLED**—NM1B Panels are assemblies of totally enclosed MB units containing accurately calibrated and sealed thermostatic protective elements. Electrically and mechanically adapted to quick installation, easy expansion.

**COMPACT**—Most suitable for use in restricted space... with special narrow Column Type Panels available for installation in the web of "H" columns.

**LONG LIFE**—Thermostatic bi-metal element, deflected by heat from overload, will operate thousands of times without damage to element. Does not, however, allow minor or momentary overload to interrupt service.



**AVAILABLE**—for alternating current as follows: Single Phase, 3 Wire, 115/230V. grounded neutral; Single Phase, 2 Wire, 115V.; and 3 Phase, 3 Wire, 115V. Can be supplied with either lugs or circuit breakers in the mains.



Branch circuits are available in 15, 20, 25, 35 and 50 ampere capacities, single and double pole. Flush or surface mounting. Also available in column type for 10" "H" beams and 7 1/4", designed for 8" beams.

Illustrated and described in Trumbull Bulletin No. 309.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY • PLAINVILLE, CONN. • A GENERAL ELECTRIC ORGANIZATION

OTHER FACTORIES AT NORWOOD (CONN.) O. — SEATTLE — SAN FRANCISCO — LOS ANGELES

# Reduce

**NOTE FROM THIS CHART HOW INTERTEEN CAPACITORS** release power capacity. Blue line indicates how capacitors solved the production problems of a midwest factory.

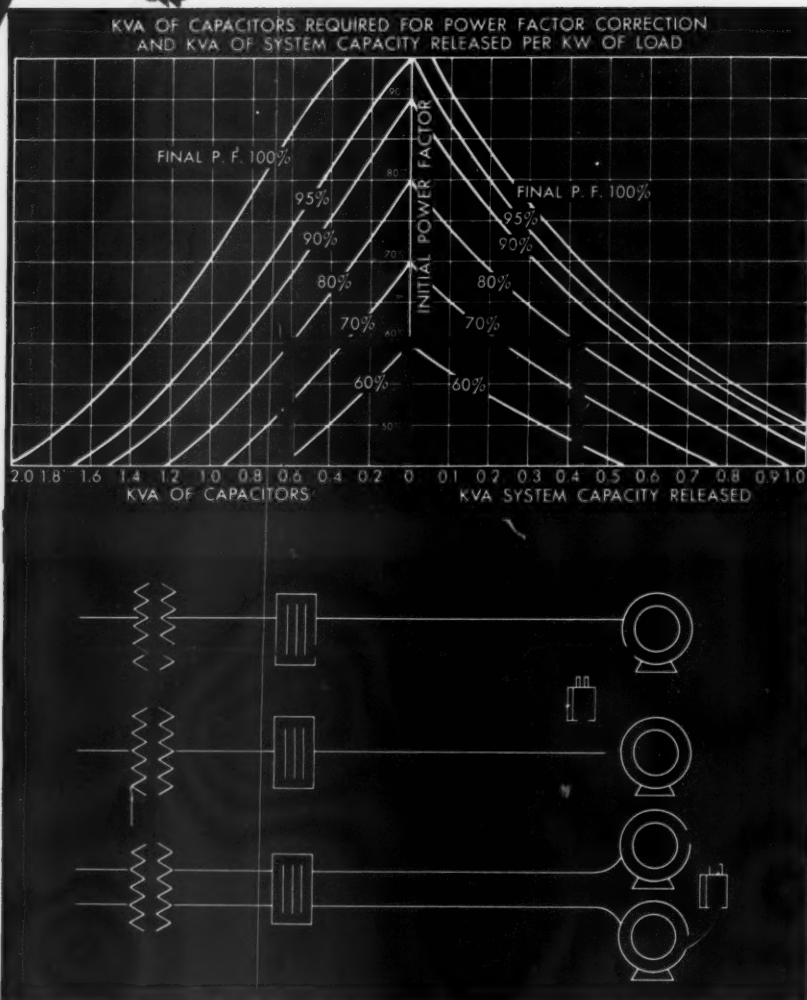
**THE PROBLEM:** To get more production from existing facilities.

**THE SOLUTION:** Installed capacitors, raising power factor from 60% to 80%.

.6 Kv-a of capacitors were required per Kw of load (A).

**THE RESULT:** .42 Kv-a of capacity was released per Kw of load (B).

No new lines were needed to provide this "power for victory."



Induction motors draw two kinds of current.

Capacitors neutralize "out-of-phase" amperes relieving wiring, transformer, switching equipment and generators.

Result: More capacity for war production!

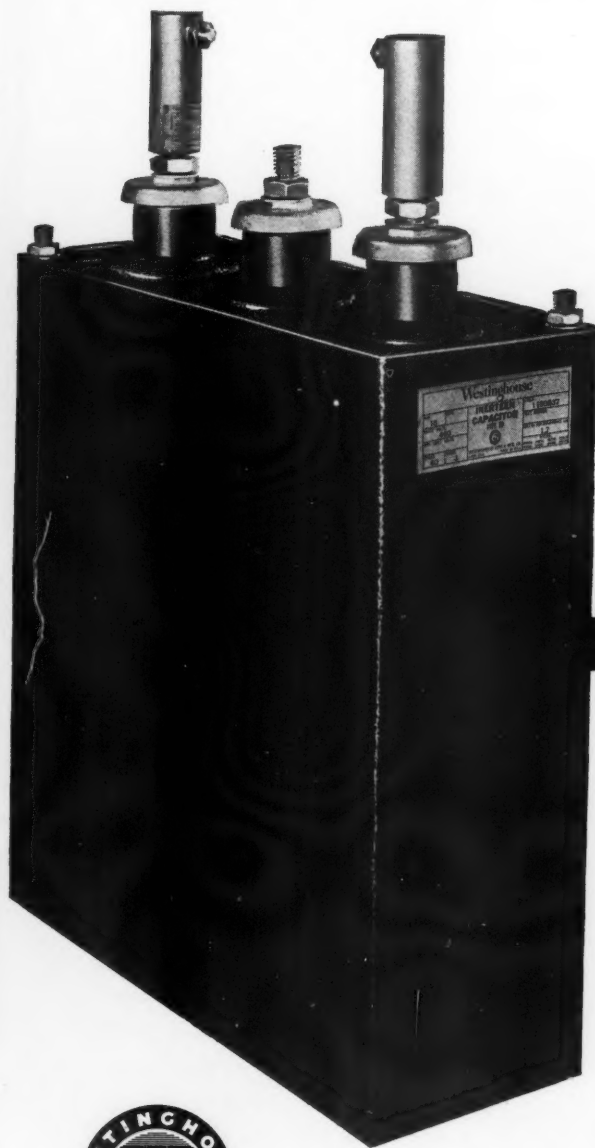
## Westinghouse

PLANTS IN 25 CITIES...OFFICES EVERYWHERE



# power losses

## ADD KV-A FOR VICTORY



Westinghouse capacitors provide the perfect answer to today's need for "Making the Most of What We've Got."

By installing capacitors on existing power lines, we can:

1. Secure additional productive capacity from existing lines.
2. Save critical materials required for the construction of new lines.

One-third to  $\frac{2}{3}$  Kv-a of load-carrying capacity is released by every capacitor Kv-a installed . . . lighting and motor performance is improved . . . dangers incident to overloaded systems are eliminated.

J-90471



For facts about capacitors and information on other methods of saving critical materials, send for this book. It tells how to:

**SAVE CRITICAL MATERIALS** in selection, application and use of electrical equipment.

**USE NEW METHODS** developed by Westinghouse to speed war production.

**KEEP EQUIPMENT RUNNING** through proper maintenance and repair service.

**REPLACE CRITICAL MATERIALS** with Micarta and Prestite.

**SAVE SCRAP** by systematic salvage.



WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PA., DEPT. 7-N

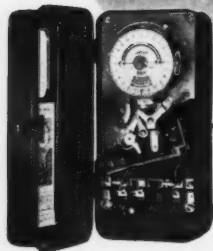
Electrical Contracting, April 1943

# AUTOMATIC CONTROL

## URNS PROTECTIVE LIGHTING ON AND OFF AT RIGHT TIMES



**Sangamo**  
TIME  
SWITCHES  
Give users Dependable  
Operation of  
Protective  
Lighting



### DURING BLACKOUTS

During any current interruptions, or for instance when a master switch is pulled for a temporary blackout, Form VSWZ Astronomic Dial Time Switch will continue to run for ten hours. An automatic carry-over feature provides for clock-spring operation when the current is off. The

clock-spring rewinds automatically when the current is restored, and the time switch resumes its normal synchronous operation.



★ Through the simple installation of Sangamo Time Switches users get Automatic Control of protective floodlighting. This adds to the protection of floodlighted factory yards, building approaches, railroad sidings, storage yards, and other vital property serving in America's Victory effort. The Sangamo Astronomic Dial Time-Switch also adds convenience, because the frequent resetting for the changing length of daylight is unnecessary. This switch does this automatically—every day—in exact accordance with sun-time. A complete line, including astronomic dial, automatic carry-over, and outdoor time switches, permits the selection of the exact form of Sangamo Time Switch for any specific requirement.

**SANGAMO ELECTRIC COMPANY** **SPRINGFIELD ILLINOIS**



POWER FAILURE HERE IS **SABOTAGE!**

## *Guard Vital Circuits*

WITH

Central **RIGID STEEL** Conduit

"There's Tested Strength  
In Every Length"



One after the other—American Liberty Ships slide into the sea. Vital circuits supplying production power must not be sabotaged by shock, vibration, twisting, or moisture.

CENTRAL'S consistent uniformity, accurate threading and easy workability speeds installations for shipbuilders and electrical contractors . . . wherever vital conduit goes.

SOLD BY

**SPANG CHALFANT, Inc.**

General Offices: GRANT BLDG., PITTSBURGH, PA.

District Offices and Sales Representatives in Principal Cities





## Now...MILLER offers new Reflectors of MASONITE with exclusive IVANITE finish!

**W**e wanted the sturdiest, most durable non-metallic reflector we could get for the MILLER 50 FOOT CANDLER and 100 FOOT CANDLER.

After testing many materials, we selected Masonite Reflector Board. It was developed especially for use as a reflector and provides the qualities of strength and permanency that Miller Products always have. Next, we treated it with IVANITE, an exclusive finish developed right here in our own plant. The result? A rugged, light-weight, easy-to-handle reflector with a durable high reflection factor... plus conspicuous savings of precious steel for Uncle Sam.

That's typical of the mechanical ingenuity behind the MILLER Continuous Wireway Fluorescent Lighting System. It's the kind of engineering that provides such proven user-benefits as *low installation cost, daylight efficiency, easy maintenance, complete mobility.* (Check column at right.) And it makes MILLER 50 FOOT CANDLER or 100 FOOT CANDLER the ideal lighting system for today's war needs, tomorrow's shift to new products or changed plant layout.

Your nearby MILLER field engineer can discuss these good things in terms of your specific interests. Call him in today, or write us direct.

### CHECK THESE MILLER FLUORESCENT FEATURES

**INSTALLATION SAVINGS**—MILLER's CONTINUOUS WIREWAY contains all wiring and necessary auxiliaries—MILLER's flanged top channel permits clamp strap attachment at any point for quick mounting or hanging to any type superstructure.

**DAYLIGHT EFFICIENCY**—Adequate, productive, modern lighting for your specific plant needs, evenly distributed to every working surface.

**EASY MAINTENANCE**—new durable, light-weight reflectors of MASONITE Reflector Board with exclusive IVANITE finish are easy to handle and keep clean—demount simply and quickly, can even be handled by women workers.

**COMPLETE MOBILITY**—entire rows of units are easily moved—units in rows can be cut out readily.

### THE MILLER COMPANY • MERIDEN, CONNECTICUT

**ILLUMINATING DIVISION**  
Fluorescent, Incandescent  
Mercury Lighting Equipment

**OIL GOODS DIVISION**  
Domestic Oil Burners  
and Liquid Fuel Devices

**ROLLING MILL DIVISION**  
Phosphor Bronze and Brass  
in Sheets, Strips and Rolls

**WAR CONTRACTS DIVISION**  
War Material



Plants with  
obsolete equipment  
can not compete  
with those  
modernly equipped...

✓ *Check up*  
on your  
electrical distribution  
system—including

- ☐ Switchboards
- ☐ Panelboards
- ☐ Safety Switches
- ☐ Wiring

If they are not the best for the job they must do — today or after the war — plan now to replace them. Higher production costs are the penalty for not modernizing.

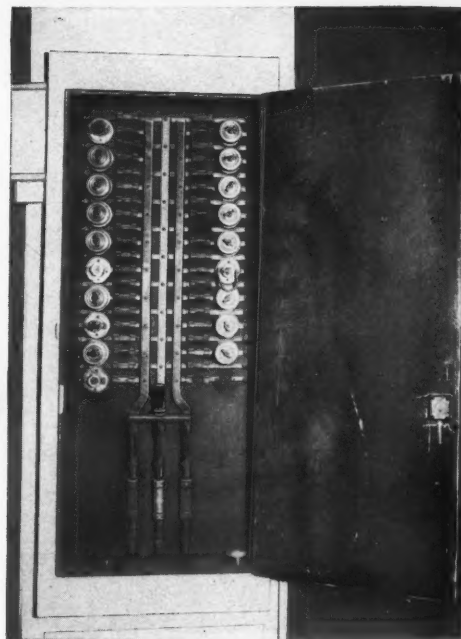
### Consultation—without Obligation

There is an **FA** Sales-Engineer near you who will be glad to consult with you or your engineer and to inspect and report on your electrical system. If it is efficient and in proper condition, he will say so. If not, he will suggest changes for betterment. After that — it's up to you.

If you are engaged in war production, and changes are desirable to reduce costs or increase output, **FA** can give you good service. If not — we'll have to wait until Victory perches on our banner.

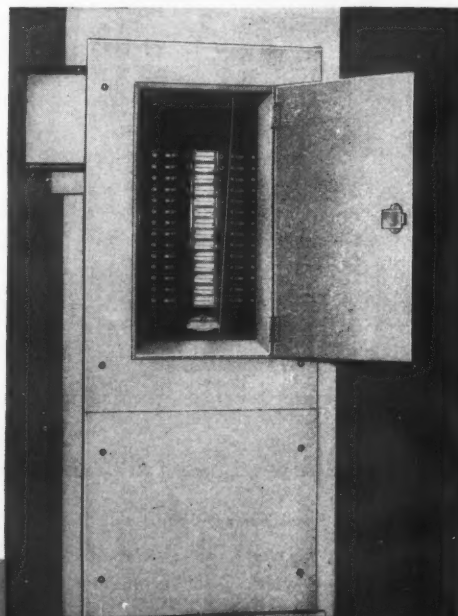
In either event —

*Plan Now!*



▲ This old **FA** Fuse-Type Panelboard had been used for many years. Still serviceable, it was obsolete — upkeep out of reason, repair parts no longer obtainable. Its 20 circuits could not meet the demand. And the exposed bus bars and main knife-switch carried an element of danger.

Replaced with this efficient, safe and decorative **FA** Panelboard, 28 circuits were installed in one-third less space. Modern automatic protection was assured by the **FA** Dablbrak Circuit Breakers, which also made restoration of service simple and easy. All current-carrying parts are covered. ▼



For more than fifty years one of the country's leading producers of electrical equipment for industrial, commercial and residential use.

# THREE WAGNER PRODUCTS that will speed your War Production

You can be assured of reliable performance, low maintenance and continuity of service in your "all-out" production efforts by specifying Wagner for all your motor, transformer and bridge-brake needs. You can depend upon Wagner too, because Wagner's large, modern plant is operating day and night to meet the demands for these items — products that have proved their efficiency and dependability through 50 years of faithful service to industry.



## MOTORS



Type RP Polyphase Squirrel-Cage Motor.

Wagner motors are built in a wide range of types and sizes with electrical and mechanical characteristics to fit the requirements of all types of motor-driven machinery and equipment. Bulletins MU-176, MU-182 and MU-183 illustrate and describe the complete line of Wagner motors. Everyone responsible for the purchase and maintenance of motors should have these bulletins.

## TRANSFORMERS



Noflamol Transformer, (Non-Inflammable Liquid Filled.)

No matter what the requirements may be, Wagner can furnish the right transformer for the job. The Wagner line of transformers include power, distribution, and Noflamol transformers, and constant-current regulators. Bulletins TU-180 and TU-181 give complete information on the complete line. These bulletins contain information valuable to every transformer user.

## BRIDGE BRAKES



Type H Hydraulic Bridge Brake.

Today, Wagner bridge brakes are standard equipment on most overhead cranes. Wagner bridge brakes are available in type H for inside cranes, and type HM for outside cranes where automatic parking attachment is desirable. You should have bulletin IU-20. It will be mailed you on request.

## Field Engineering Service!



Wagner has 25 sales and service branches located throughout the country. Trained field engineers are always ready to assist you in selecting motors, transformers, or hydraulic bridge brakes, to meet your particular requirements.

## Wagner Electric Corporation

6400 Plymouth Avenue, Saint Louis, Mo. U.S.A.

Gentlemen:

EC E43-1

I would like to have free copies of motor bulletins MU-176, MU-182, and MU-183 ☐. Transformer bulletins TU-180 and TU-181 ☐. Hydraulic bridge brake bulletin IU-20 ☐.

Name \_\_\_\_\_ Position \_\_\_\_\_

Company \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

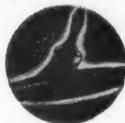
MOTORS • TRANSFORMERS • BRIDGE BRAKES



# HOW TO GET EXTRA LIFE AND EFFICIENCY FROM ELECTRICAL WIRES AND CABLES



**1**  
**STORE CABLES IN A COOL PLACE**—High temperatures tend to break down rubber. Store in a cool (not cold), uniform temperature. Cable insulation is kept in the best condition for the longest possible life. Always avoid extreme temperatures.



**9**  
**SPICES WILL LAST LONGER** when protected by a coating of weatherproof paint.



**17**  
**VENTILATE POLE RISER CONDUITS** and create circulation by making openings near the top or by leaving space between the conduit and polehead. This can improve the efficiency of an entire circuit.



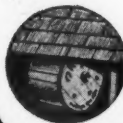
**2**  
**KEEP REELS AND COILS OFF GROUND**—Continuous moisture rots wooden reel heads and thence cable coverings. Round reels are easier to handle and well-preserved cable coverings give longer life in service.



**10**  
**PROTECT THE JOINTS OF CABLES IN MANHOLES** from fire by proper fireproofing.



**18**  
**SPACE YOUR CABLES** as close together as possible on overhead circuits if you need to reduce reactive voltage drop. Leave sufficient space for air circulation to prevent overheating.



**3**  
**PROTECT CABLES FROM WEATHER**—Sunlight, light rain, snow and freezing can hasten deterioration of rubber sheaths and thence coverings. Keep cables under cover. Otherwise, be sure to keep laying on reels.



**11**  
**UNDERGROUND INSTALLATIONS** (without ducts)—Keep ground saturated with water to lower earth temperature and dissipate heat more readily.



**19**  
**PROTECT** cables from being run over by heavy moving equipment. Dropped around sharp corners, yanked to remove kinks.

## Get this Handy Wall Chart FREE!

Now, when electrical wires and cables are difficult or impossible to replace, it is more important than ever that your electrical maintenance men take good care of your wires and cables to secure maximum life and efficiency. This handy wall chart will show them how to do it.

We will be glad to supply, free, as many reprints of this chart as you require.

**THE OKONITE COMPANY**  
and **HAZARD INSULATED WIRE WORKS DIVISION**  
Executive Offices: Passaic, N. J.  
Offices in principal cities

**12**  
**TUNNEL INSTALLATIONS**—ventilate tunnels with grills where possible or install a fan at one end of the tunnel to force hot air out. Make sure circulation goes all the way through tunnel so hot air does not pile up at one end.



**20**  
**SHIFT** cables and cables away from high voltage equipment and sparking motors. Such machines generate ozone which attacks rubber and hastens its deterioration.

**13**  
**POOL INSTALLATIONS**—when possible circulate cool water through or flood duct lines and keep machines flooded. But be sure your cables are water-tight.



**21**  
**DON'T** run cables and cables over small diameter pulleys or drums. Continued bending and flexing around a short radius breaks the conductors. Use larger diameter pulleys.

**14**  
**HEATING UNITS** or hot pipes, move or shield or insert barriers between steam pipes and cables to deflect hot air from the cables.



**22**  
**WIPE** cables regularly as they are free from oil, grease and chemicals. Such agents attack rubber.

**15**  
**BOY LOCATIONS**—Cut air vents in the top of partition above cables to provide adequate circulation by means of natural convection or install fans.



**23**  
**KEEP** cables out of light and sunlight as much as possible when in use. Light tends to harden rubber—thus hastening cracks.

**16**  
**TEST** CABLES for evidence of mechanical deterioration at conduit edges and for over-distribution and abrasion. Eliminate the loss by retaining cables and applying protective paint.



**24**  
**MOVE** cables away from steam lines, hot pipes and hot objects. High temperatures damage rubber.

Insulation will then last longer with the same conductor load, or more current can be carried in the same cable without shortening its life.

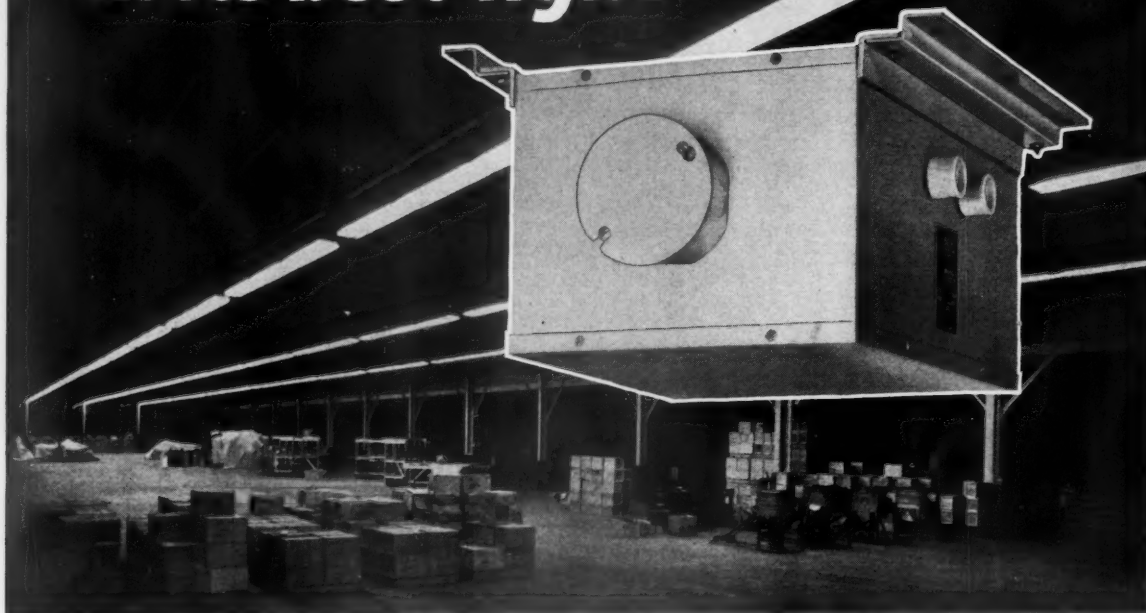
**THE OKONITE COMPANY**

PASSAIC, NEW JERSEY  
OFFICES IN PRINCIPAL CITIES

BUY U. S. WAR BONDS Every Payday All Okonite Employees BUY U. S. WAR BONDS

3219

# Presenting Cold Cathode in its *best light*



**W**AR WORK was made to order for cold cathode lighting. This "rugged" type of illumination is unaffected by shock or vibration. It requires a minimum of critical materials. And, properly installed, it can produce the steady volume of non-glaring, non-tiring, shadowless light so necessary for precision operation.

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Rely on efficient, sturdily-engineered Sola Transformers. They are an assurance that your installation will "stay on the beam"—will deliver a constant intensity without overload hazards or low-voltage flicker. They are an assurance of trouble-free operation, uniform high performance and business-building goodwill.

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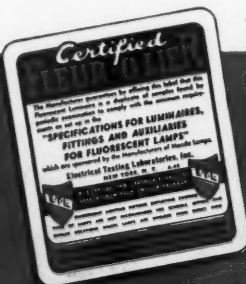
### Why they're dependable

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FROM these reserves, two extra pounds of ore must be used for each pound of scrap you fail to turn in.

Vast as they are, America's precious iron deposits are not limitless. Considering the terrific drain on them now for those extra pounds to win the war, experts say our high-grade Lake Superior district reserves will be exhausted in a few more years . . . by 1950 . . . or sooner.

So the steel industry needs every pound of scrap you can muster . . . today, next week, next month, every month. Scrap is vital for Victory over the Axis . . . and vital also, to conserve the natural resources we shall need for reconstruction after Victory.



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# Food—The Deciding Issue

*Our food problem remains to be solved*

---

THE first thing the Germans did when they occupied Czecho-Slovakia, Poland, Belgium, France—was to empty all warehouses. Everything went into trucks headed for Germany.

The Nazis knew that this war would be won by the army that had the most supplies and the best supply system.

The Nazis knew that supplies are as essential as guns. They knew that the most essential of all supplies is... food.

Being the only people on earth who can watch women and children starve, the Nazis seized upon food as their most powerful instrument for disciplining the masses. They added famine to their arsenal of conquest.

The flocks and herds of Europe are being consumed with alarming rapidity. The desperate shortage of meats and fats is growing steadily worse. Our Allies are short of certain foods that we must supply if we expect them to carry on.

And as we supply them, as our imports are curtailed, as our fighting men consume more than they do in civil life, and as we fail to increase our production rapidly enough... we, too, become short of certain foods.

Former President Herbert Hoover, speaking before a conference of the Governors and Representatives of twelve Mid-Western farming states in Des Moines on March 15th, sounded the warning that American agriculture, beset by Washington bungling on manpower, farm machinery and price systems, strangling production and distribution, is facing a deterioration which may bring on a national food shortage such as led to the collapse of Russia, the defeat of Germany in the first World War and the fall of France in the present war. Unless this deterioration is stopped, warns Mr. Hoover, we cannot hope to win the present conflict.

Complications of similar magnitude face the food processor and the distributor.

Never in the history of the world has man's dependence on food been so crucial. Yet it is not easy for us to grasp the full significance of the crisis. We are so accustomed to finding milk, eggs and butter on our doorsteps every morning, we are so used to filling our pantries from the shelves of our grocers and markets that we accept food as something that is due us on demand. We do not stop to think that we never are more than a few meals ahead of famine.

But this picture has changed. Now we are faced with

food rationing, and every day the shelves of our food markets become more bare.

\* \* \*

Let it be noted that the appointment of two Food Administrators has not solved the food problem. It is still with us; daily it becomes more critical. Unless it is solved, and solved quickly, the very food that ex-Food Administrator Wickard said would "win the war and write the peace" may lose the war and lose the peace.

Put very simply and clearly, the food problem amounts to this: we are trying to feed upward of 200 million people. We are trying to do it with the farms and other facilities that heretofore have been capable of feeding about 145 million people (our present population plus a 5% surplus).

Had the Government foreseen the need and planned ahead, we could have begun by 1941 the enlargement of our farm production and food processing capacity. Two irreplaceable years have been lost!

The gravity of the situation becomes apparent when we consider that 50,000 factories are required to process our foods. Food processing not only is America's biggest industry—it is one of America's most important for, without processing, most foods would perish before they could reach the consumer. The term "processing" covers the salting, drying, smoking, pickling, chilling, canning, packing and other methods of preservation that make it possible for us to eat in 1943 food that was produced in 1942. Few realize that most of the food we shall eat in 1943 was produced and processed last year, that most of the seed we plant this spring will grow food for 1944 or perhaps later.

In one important process of preservation, tin and rubber are vital materials. When the Japs captured Malaya and the Netherlands East Indies more than half of the world's tin and nearly all of its rubber fell into their hands. This forced drastic changes upon our entire food economy. The importance of tinplated steel containers, tops for glass jars and rubber gaskets is fairly obvious... metal food containers alone consume, every year, more than 2,700,000 tons of steel.

The aggression of Japan has snared our whole food industry in a maze of intricate packing problems. It has enforced recognition of a new principle of food technology, i.e., that the method of food preservation is determined by the type of container available. The tin, steel and rubber stringency compels many food processors to adopt

unfamiliar methods—methods that call for a great deal of new equipment. This, in turn, involves the use of critical materials that are so urgently needed for other war purposes.

This conversion of the food processing industry to meet these exacting restrictions has been greatly complicated by two factors that have increased its wartime burden. Indeed, it is these that provide the principal reason for civilian food rationing.

The first of these is the task of feeding our armed forces overseas. Allied ships are being sunk at an alarming rate and the loss of cargo is considerable.

The second factor gravely augments the first. Under Lend-Lease our country is undertaking to feed our Allies to the extent of approximately 60 million people.

Types of food required for Lend-Lease and the armed forces are the finest we can produce. They are the high protein foods, especially meats, cheese and milk; and the protective foods which rate high in vitamin content. Peculiarly enough, the more valuable a food is from a nutritive angle, the more specialized is the processing required to preserve it.

The food processing industry, handicapped as it is, is meeting today's challenge with resourcefulness and enthusiasm . . . despite container complications and shipping shortages.

It is accomplishing its Herculean task by resurrecting and modernizing a method of food preservation that is as old as mankind. Probably you have read a great deal about dehydration. You actually may have eaten dehydrated food, but right now nearly every bit of dehydrated food is earmarked for the armed forces or for Lend-Lease.

Food processing never will be as spectacular as the production of bombers or tanks. But under today's conditions, the performance of the food processor is no less important . . . no less inspiring. When we consider that dehydrated food is compressed into solid blocks with a density nearly equal to that of coal, so that almost a whole meal can be carried in a vest pocket, and that half of the shipping space is thereby saved in transportation, we begin to appreciate what the processors have contributed to meet the food problem imposed by the war.

But they have not only contributed new methods, they are achieving new highs in production. And now they are asked to do what borders on the impossible. Consider dehydrated egg powder. Normal production in pre-war

years was about 3,000,000 lbs. In 1940 this was increased two and one-half times, in 1942 it was stepped up again, this time forty-fold. And in 1943 the call is for another 60 per cent boost, to make a total of 480,000,000 lbs. Dried milk powder production of 350,000,000 lbs. in 1940 must be increased to 685,000,000 lbs. in 1943.

Vegetables, which were a small item to the processor before the war, now are dehydrated in enormous quantities. The vegetable dehydration industry has had to grow by leaps and bounds without benefit of the high priorities accorded to arms, ship and aircraft building. Production of dehydrated vegetables in 1942 was four times that of 1941, and 1943 calls for a sixteen-fold increase over 1942.

Total dehydrated food production in 1943 is scheduled at 1,750,000,000 lbs., dry basis . . . all for export. Multiply that by 10 and you have a rough approximation of the astronomical amount of raw materials that will have to be produced.

Many problems remain to be solved in the troublesome days that lie ahead. But with all his resourcefulness, man has little control over the weather. A severe drought could wipe out all of man's carefully laid plans. If we are tempted to reassure ourselves with the thought that the food situation probably is not so serious as it is painted, it will be well to remember that last year's crop increase over 1941 was due to better

than average growing weather.

The war-bred food crisis that now confronts us will be met only by immediate measures to insure a food production ample to allow for adverse weather conditions. The food processing industry is capable, but has not been granted the needed help, in coping with its tasks. The food problem as a whole involves all three functions of production, processing and distribution. And if we are to master the problems that now beset us, all three of them must be coordinated under a single administrative control. "Food will win the war and write the peace". But if American food is to do that double job, we must develop a capacity for food administration comparable with the genius of our food industries.



President, McGraw-Hill Publishing Company, Inc.

*This is the tenth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.*

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# one

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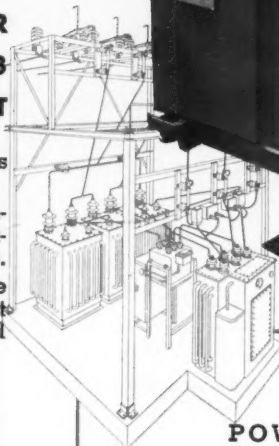
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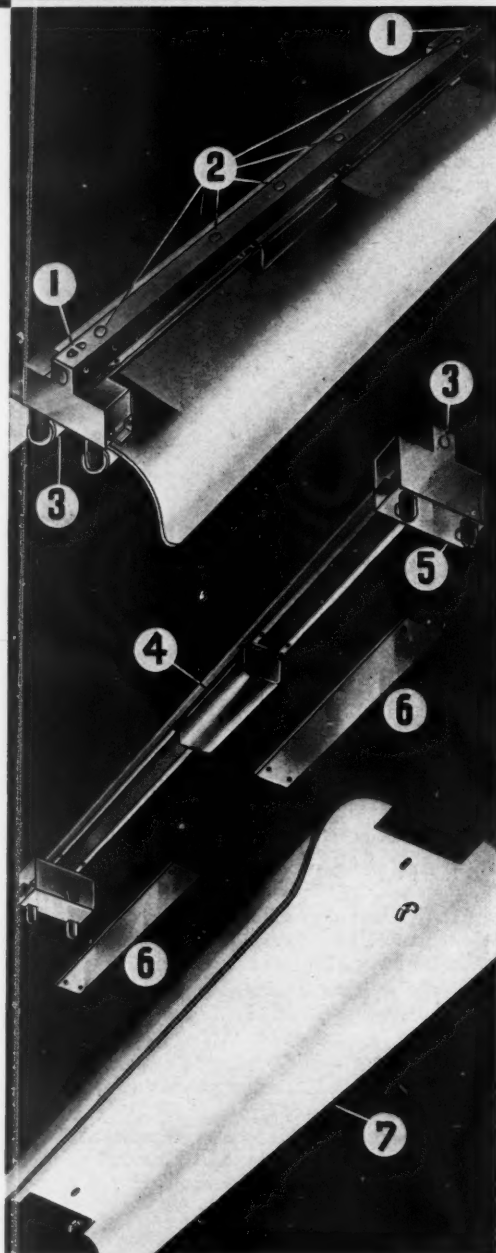
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### *Conserves Material*

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### *Conserves Space*

Requiring less floor space means more production per square foot.

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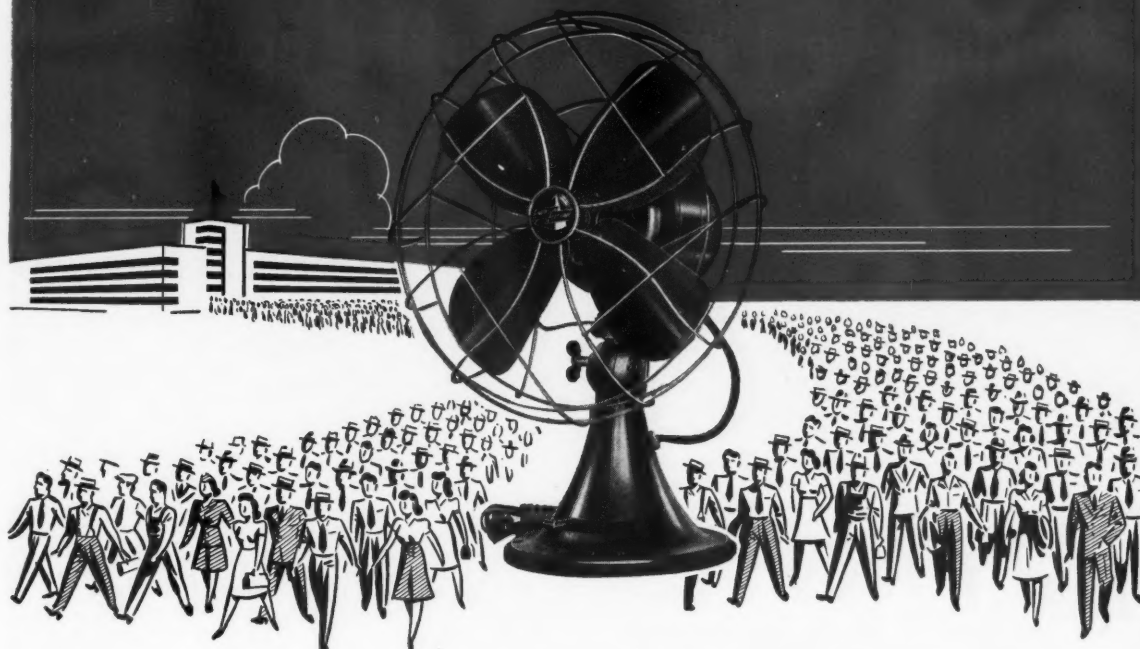
Efficient utilization of power means low energy cost per piece.

### *Conserves Manpower*

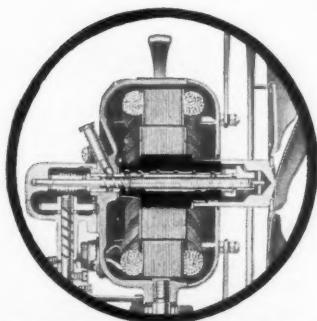
Reducing overall time for processing means less labor, less handling, and fewer manhours.



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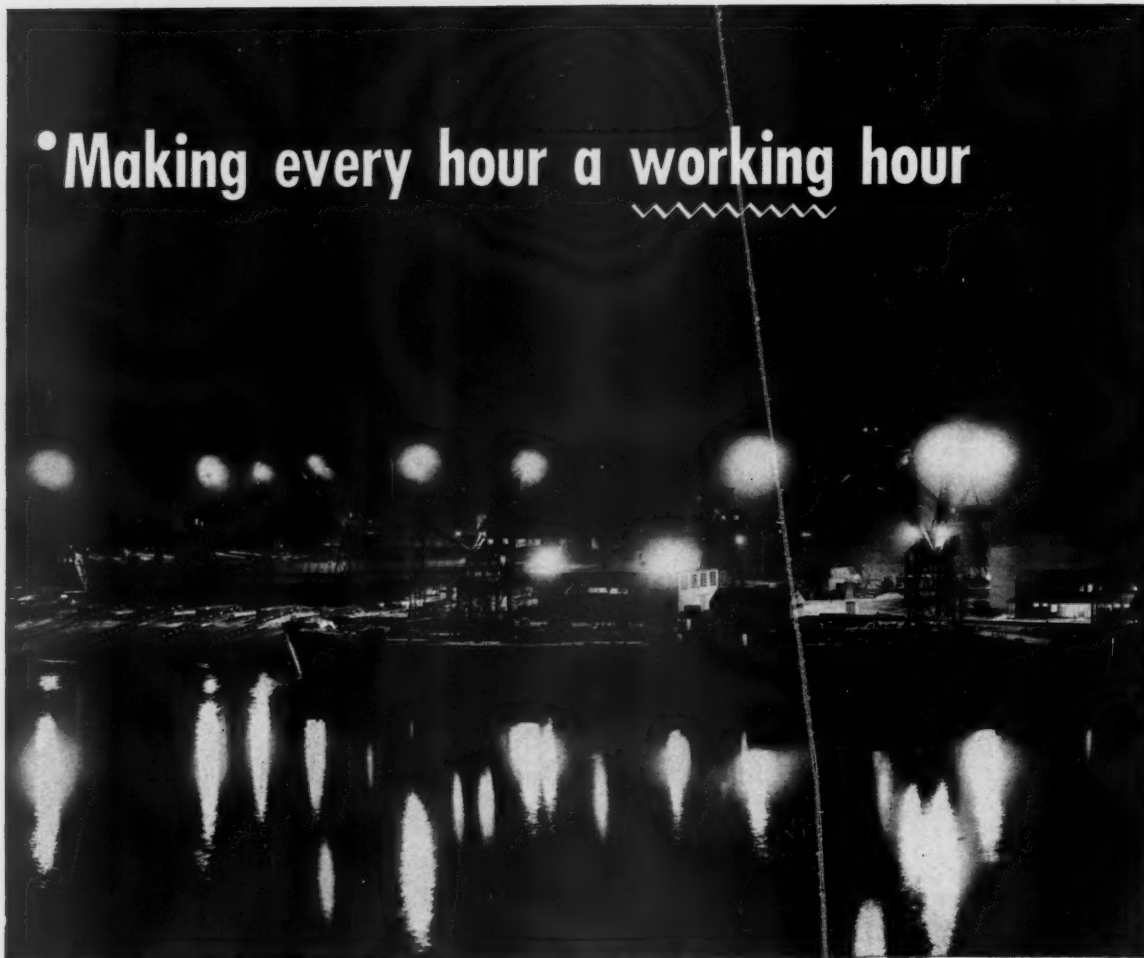
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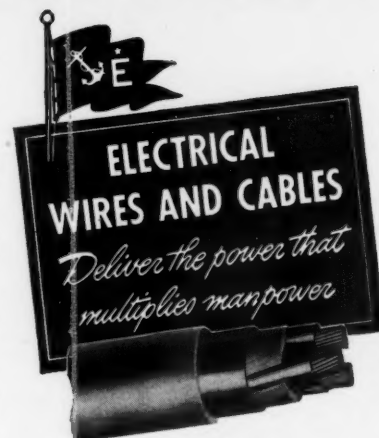
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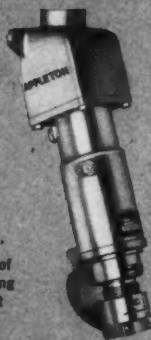


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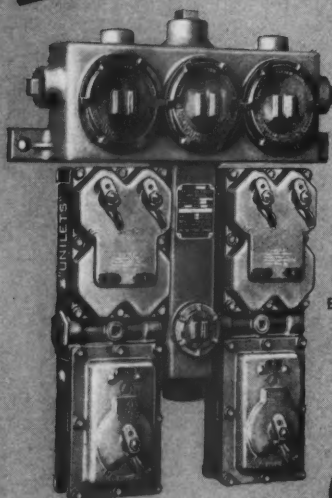
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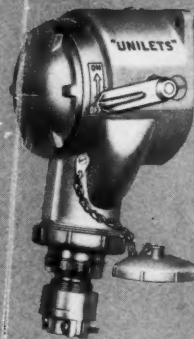
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43225

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Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding production.

Individual .....

Company .....

Address ..... City .....

4P



# Electrical Contracting

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## **ELECTRONICS AHEAD**

If you stop the average man in the street and ask him what he thinks the future holds he will inevitably mention electronics as one of the great fundamental new industries that will change our lives.

There's glamour in the magic and mystery which has grown around electronics. It fires the imagination. And rumor has carried the wonders that will appear, when the veil of wartime censorship is lifted, to the fantastic.

But around home, within our industry, it is about time that we started to take stock of just what electronics means to us. Where do we fit? In this great loosely joined family of electrical men there isn't even a common language.

We talk of industrial electronics. But the jargon of the electronics engineer has grown in a world apart, the world of communications and radio. And the power application engineer who is concerned with industrial control has an entirely different lingo. Let's set this down as Family Problem No. 1—a common language.

Now let's look at what electronics means to us. Electrical devices using electron tubes can do a lot of things more easily, better and more efficiently than previously available apparatus. They can also do things that no other equipment can. But it is a long hard row between the mere recognition of the possibility and the actual equipment on the job. Therefore, let's call this Family Problem No. 2—closer, practical liaison between the electronics expert and the industrial specialist.

And then all the family has to live with this glamorous newcomer. The electrical contractor will be installing electronic equipment. The inspector will be thumbing his code for appropriate safety rules, the maintenance engineer will be writing out requisitions for replacement parts and tubes and all will be wondering about service. Who will take the call, the factory, the contractor, the maintenance department, or the corner radio shop? None of us can afford to underestimate the importance of this problem. Upon its solution the progress of electronics in industry will depend. It's Family Problem No. 3.

What can we do about it? First, in my opinion, there ought to be an open industrial electronics conference between the manufacturers of electronics equipment and the rest of the electrical industry including representatives from NECA, NISA and the various electrical maintenance groups. And concurrently, electronics engineers and power engineers ought to write a common terminology.

Once linked in a partnership of common understanding of what electronics is prepared to do for industry, and what needs to be done in design, engineering, sales, application and maintenance, the electrical industry may find that fantastic vista closer than we think.

*Wm. J. Stuart*

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A P R I L , 1 9 4 3



**...we found Graybar had 'em on file"**

*(another example of the time-saving gains of Graybar MM Service\*)*

A firm that was "up to its neck" in war production was confronted with a new questionnaire from Washington concerning the amounts of strategic materials it required. Many of the essential electrical supplies used by this firm were partly or wholly made of these materials.

The compilation job looked overwhelming to the firm's overworked office staff. Then, someone pointed out that virtually all the electrical items were being purchased "via GRAYBAR." Perhaps GRAYBAR's records could help.

Sure enough, GRAYBAR's records of shipment and files of product information were so set up that it was possible to assemble the required data right in GRAYBAR's local office. So far as electrical supplies were concerned, the job

was done quickly and accurately, in strict accordance with governmental regulations.

**This is only one example** of GRAYBAR's ability and willingness to work with you to smooth out matters of record-keeping and red tape

when you buy electrical supplies. If your procurement procedure is necessarily complicated, we'll fill out every form "to the letter." But if a chance exists to help cut down on paper-work we'll try just as hard to help you find it.

**\*Serving as your MATERIALS MOBILIZER**

By this GRAYBAR service, your electrical needs are linked to the available output of 200 manufacturers, mobilized locally at more than 80 warehouses. The MM Plan "dovetails" GRAYBAR's procurement work with your own purchasing requirements. You save time in getting estimates, checking specifications, expediting delivery, locating "hard-to-get" items. Ask your local GRAYBAR Representative how this "one-call" service can help you.

Executive Offices:  
**GRAYBAR BUILDING**  
New York, N. Y.

**GraybaR**

IN OVER 80 PRINCIPAL CITIES



SUBSTATION layout, incoming line switchgear is located in rear cubicles, feeder control in cubicles at left. Lights on goose necks above cubicles show breaker position.

# Wiring Bell Laboratories



Research laboratories all over the world were studied to make the wiring system of the Murray Hill buildings of Bell Telephone Laboratories the finest available with utmost flexibility and safety the determining characteristics.

By C. T. Siebs\*

It is a characteristic of research that neither its final products, its course, nor the means it employs can be foreseen in any great detail for more than a relatively short period in the future. This characteristic was one of the determining factors guiding the design of the new Murray Hill buildings of Bell Telephone Laboratories. Ready changeability in room size and in the service facilities provided had to be considered at every step. Another factor that has been given most thoughtful consideration is safety to the personnel. Although power in one form or another

is used in almost all the laboratories, it is used as an auxiliary by men whose thoughts are engaged primarily by phases of the work other than the electric power used. They cannot be expected to take the precautions that a trained electrician would, and thus every thought was given in the design of the installation to provide circuits requiring a minimum amount of maintenance, equipped with simple and obvious circuit protection, and at the same time providing individual and collective safety to personnel and equipment.

While flexibility, safety and circuit characteristics were factors of paramount importance in the design of the electrical distribution system, economic considerations also greatly influenced

the ultimate design. Since changes in space and facilities are essential to a research organization, provisions were incorporated in the fundamental design to permit such changes to be made readily and expeditiously so as to keep the yearly operating costs as low as possible.

## Primary Power Supply

The main interconnected buildings of the initial block at Murray Hill are three story with attic and cellar. The larger of the two sections is 670 feet long, and the shorter about half this length. Floor space is approximately a quarter of a million square feet.

The location selected for the boiler room, substation, and possible future generating equipment is some 1000 feet from the initial block of buildings, and was influenced by the probable ultimate development of the property. A survey of probable maximum demand and load factor indicated that for the initial group of buildings a 1500 kva. transformer bank would be sufficient, and that an ultimate capacity of 7000 kva. might be required should buildings, as originally contemplated, eventually be built for the entire laboratory. Consideration was given to the economics of local power generation. With the low load factor

\* Plant Engineer, Western Electric Company, Kearny Works, previously Assistant Construction Engineer, Bell Telephone Laboratories Inc.



WIRING CHANNELS along partition enclose subfeeders from pier risers, individual outlets are separately protected.

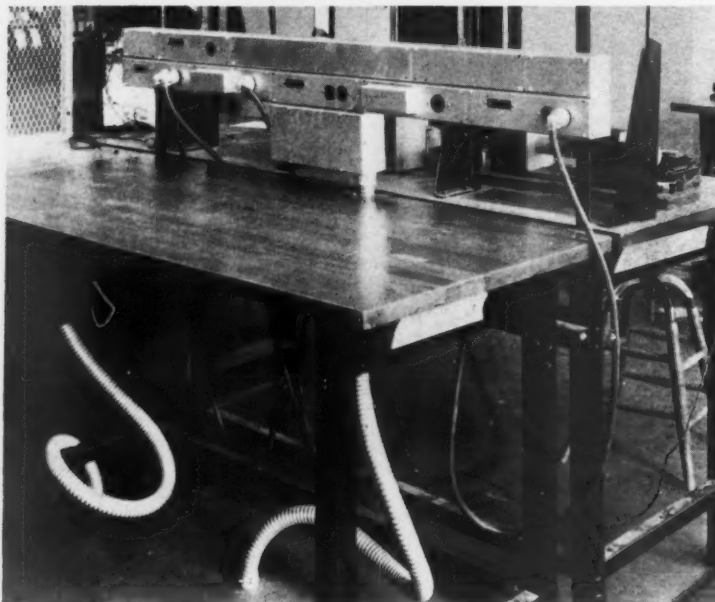


TABLE OUTLETS are connected by flex to conduits in floor. Flexible cables include a grounding wire. All single phase receptacles are 3-wire, three phase receptacles are four wire. The rectangular boxes on the trough are covers over three time lag fuses. The small switches are magnetic type circuit breakers.

under normal operating conditions, however, together with the limited process-steam requirements, it was not possible to improve in local generation of power.

The initial transformer bank consists of four 500 kva. single-phase transformers. The fourth transformer serves as a spare, and is arranged so that it can be cut into service in a very short time should any one of the transformers develop trouble.

When the substation load increases beyond the capacity of the initial transformer installation, a duplicate trans-

former installation is contemplated connected into the system as shown in the one line schematic.

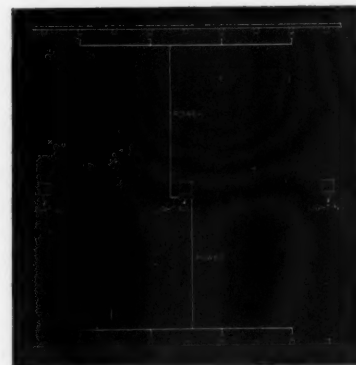
The capacity of the additional transformer bank will then probably be stepped up to 3000 kva. and the initial transformer bank changed from 1500 kva. to 3000 kva. at some later date, as and when the load demand warrants. This will improve the substation design, and will, in the event of a transformer breakdown, reduce the outage time to that required for a switching operation.

Arrangements were made with the

utility to supply 13 kv. power to the substation from Chatham substation through an overhead pole line ring main taking separate routes to our property. This eliminated to a considerable degree the possibility of shutdown due to outage from storm conditions.

The 13 kv. power was brought to our property on a single pole line through two separate feeders, and was fed into the substation by two underground cables terminating in outdoor type 15 kv. metal-clad switchgear and lift-up type oil-break circuit breakers having an interrupting capacity of 75,000 kva. From this switchgear bank, the power supply was fed to three single-phase substation transformers using three-phase delta primary and 3-phase wye secondary connections through three 10 percent single-phase step regulators, capable of maintaining the voltage on the 4 kv. side to within  $\frac{1}{8}$  of 1 percent as a steady condition, and to within probably 1 percent to  $1\frac{1}{2}$  percent under a fluctuating 13 kv. voltage condition. By suitable line-drop compensation, these regulators are set to be actuated by the voltage in the main laboratory buildings, rather than by the voltage at the substation itself. Spare conduit was installed throughout the transformer slab to permit future growth without affecting the initial installation. The step regulators are each provided with a by-pass and disconnecting switchgear so that maintenance and repair can be effected without interfering with service continuity.

A single-line diagram of the circuit to the outgoing 4 kv. feeders is shown. Disconnecting potheads do not take the place of disconnecting switches, but are used here to provide a means for isolating the underground cables from the overhead wiring at the substation, since cable faults, if they do occur, would probably occur in the underground runs.



TYPICAL DISTRIBUTION riser layout for each 48 linear feet of building.

Electrical Contracting, April 1943



Primary regulated 4 kv. power is fed from the substation to the Laboratory buildings through two underground feeders with conduit provision for one spare. Each feeder consists of three 7 kv., 3/0, single-conductor rubber-lead cables, of the oil-base rubber type, and color coded on the surface for phase designation. One smaller underground feeder supplies 4 kv. power to the sewage-pumping station at which point a 37.5 kva., three-phase 4150/120/208 volt transformer supplies this building with power and light. This latter cable is fed through disconnecting potheads by the oil switches controlling one of the main feeders to the laboratory, and the boiler house transformer is connected similarly to the other feeder.

The apparatus in the substation may readily be identified in the photograph. The four transformers are in the center with the step regulators directly in front of them. Behind the two left hand transformers are the 13 kv. oil switch and metering cubicles, and at the extreme left are the cubicles containing the 4 kv. bus, feeder oil switches, relays, etc. At the rear right is the battery house, and just in front of it is the transformer supplying power and light to the boiler house. The three out-going 208-volt feeders from this transformer are mounted just to the left of the transformer.

### Secondary Distribution

Due to the transfer of apparatus and equipment designed for use on a 120/208 volt 4-wire, 3-phase, power distribution system from West Street to Murray Hill, and to the standardization of 120/208 volt 3-phase 4-wire distribution circuits throughout the country, this form of secondary distribution was decided upon for power and lighting through the Murray Hill Laboratories.

The Laboratory requirements necessitated a distribution specification so strict that many commercially developed methods of distribution had to be abandoned. Some of the more difficult limitations to be met were:

1. Stray magnetic fields had to be strictly limited, necessitating the running of all 120/208 volt main power cables at an elevation not higher than the cellar floor level, and cables had to be encased in steel conduit. This eliminated the possibility of using commercial busduct on the cellar ceiling.

2. A good wave shape was necessary. It so happened that the utility company had a good wave shape on their 13 kv. system, and so by using step regulators

in place of induction regulators, this requirement could be met.

3. The possibility of relatively heavy isolated single and three-phase loads in combination with close voltage regulation requirements throughout all buildings and floors made it necessary to design a secondary distribution system of the network order, with short feeder runs to all points of application.

4. Transformer hum had to be reduced to below a specified decibel rating.

5. Throughout the building power and light distribution system, all high tension cables, switchgear, and transformers had to be so designed and interlocked so as to preclude the possibility of accidental contact with live parts by maintenance men as well as by operators.

6. The distribution apparatus design had to be sufficiently simple to preclude the necessity of having to employ trained high-tension men for the maintenance or operating divisions.

### Design of Low Tension System

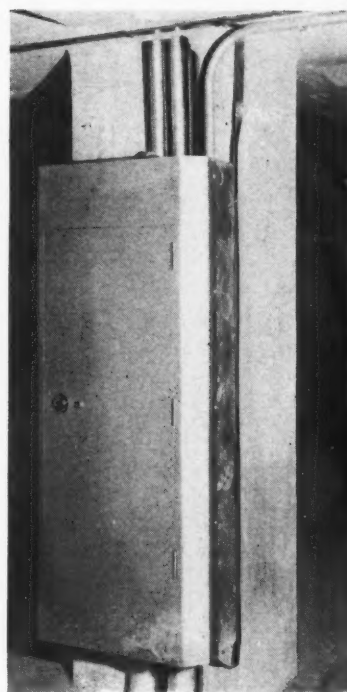
To meet the anticipated load shifts and changes in power demands due to variable occupancy requirements, and at the same time to meet the above distribution-system specification, a low tension distribution system had to be specially designed.

The low tension system developed and installed included the use of duplicate full-capacity 4 kv. feeders with provision for a future third, each protected by oil circuit breakers at the substation connected through suitable switchgear to banks of three 200 kva., 4160 volt delt, 120/208 volt wye, insulated neutral, air cooled, type B insulated transformers feeding into three low-tension secondary loops, located in the cellar floors.

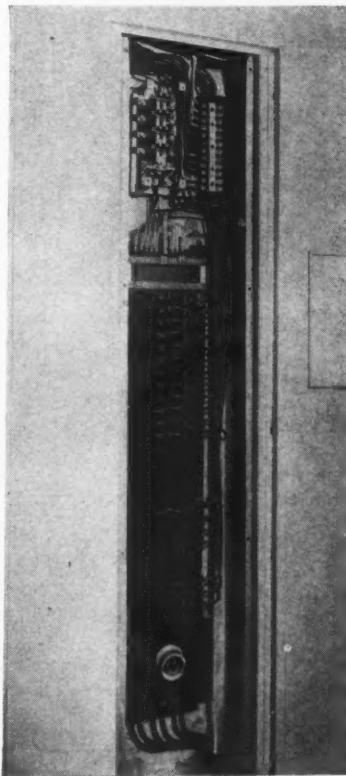
Sequence Cory interlocks were provided between the 4 kv. circuit breakers, feeding the loops. In addition to the Cory interlocks, auxiliary series electrical interlocks were included in the 4 kv. transformer feeder-transfer switches, which trip the low tension 600-ampere circuit breakers unless all transformers feeding any given loop are fed from the same 4 kv. feeder, but permits individual transformers to be cut in or out of service as the load demands.

The above series interlocks were installed both as a safety feature, to prevent the possibility of accidents due to back feed and for operating simplicity in the event of a 4 kv. feeder fault necessitating a manual changeover of all transformer transfer switches effected.

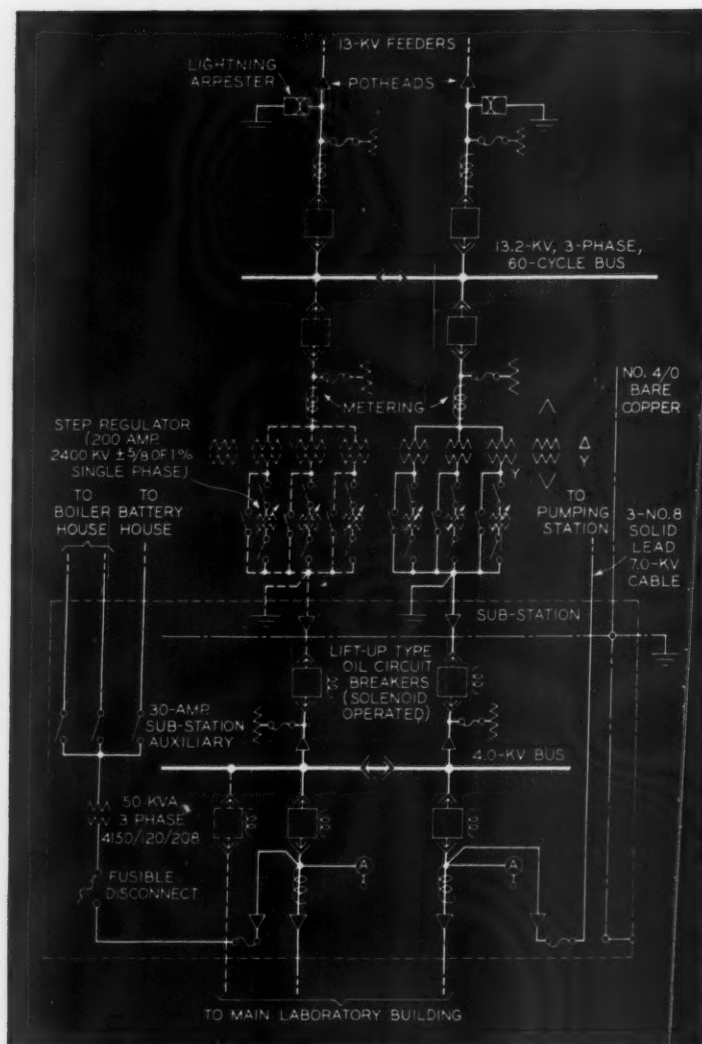
One disadvantage, as compared with the more usual network system of con-



POWER DISTRIBUTION panels in basement have beveled corners and flush door handles.



LIGHTING CIRCUITS are brought back to the panel and switched by a contactor (upper left). Terminal strip is shown at upper right. Circuit breakers have locking handles.



DUPLICATE SERVICE connections shown in single line schematic of the substation.

nections, is that continuity of service under a 4 kv. feeder fault condition is sacrificed. This feature, as applied to Laboratory power supply, was fully investigated and found to be of secondary importance as compared with the advantages gained.

#### Design of Power Loop

To meet the requirements of the secondary distribution specification, the power loop had to be installed in metallic conduit at an elevation not higher than the cellar floor. As the cellar design of all buildings included a central longitudinal aisle space, it was decided to install the loop under the central aisle floor slab, using parallel 3½-in. conduit terminating in waterproofed concrete splice box at every column location, which occurs every 24 ft. throughout all buildings.

The conduit connections to the concrete splice boxes were made watertight by passing the conduit through a simple stuffing box incorporated in the concrete splice boxes. This layout has many advantages such as breaking the otherwise closed magnetic circuit, thus overcoming conduit heating due to the unbalancing effect of local heavy single-phase loading, and at the same time permitting conduit expansion and contraction under variable-load heating conditions. Considerable expense was also saved due to simplicity of installation.

Seven 4/0 synthetic jacketed high voltage colored cables were installed in each conduit, using two cables in parallel per phase and one for the neutral. The use of two conductors in parallel per phase had several advantages over the use of single conductors. The volt-

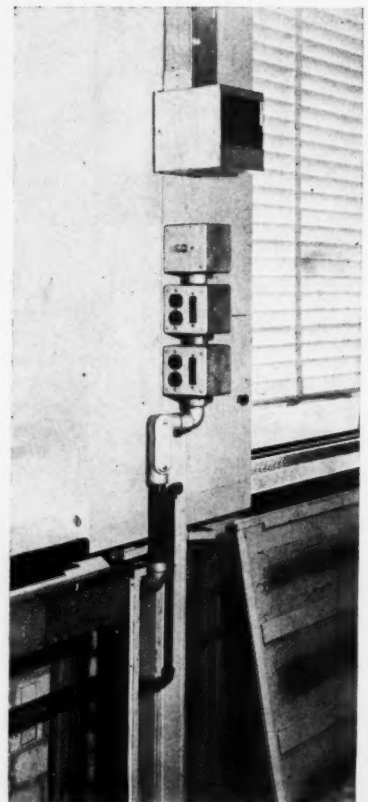
age regulation, particularly under low power-factor condition, such as motor starting, is considerably improved, the handling of the smaller cables is easier both from an installation and tapping standpoint, the size of limiters is reduced, and the repair and maintenance stock kept to a minimum.

#### Transformers Feeding Power Loops

Air cooled transformers built with Class B insulation (Mica, Asbestos, Porcelain, and Glass) were chosen for their fire-proof characteristics, reliability, and low installed cost. The transformer size adopted (200 kva.) represented the most economical size for the building loading. Using a maximum number of three transformers per loop, limited the interrupting capacity of the protecting low-tension circuit breaker to 20,000 amperes, which permitted the use of relatively inexpensive circuit breakers.

The transformer overload protection is primarily on the secondary side, although oversized high-tension fuses were also installed as additional transformer protection. The transformers and associated metal-clad high and low tension switchgear were designed as a

OUTLETS at outside pier are connected into riser and protected by circuit breakers in outlet boxes.

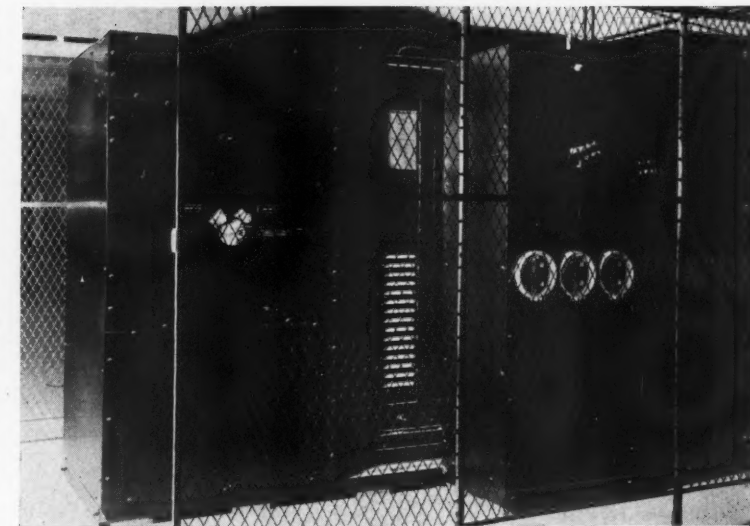


load-center unit with the transformer mounted on slide rails and capable of being installed or removed and a spare substituted through slideable contact fingers without touching any 4 kv. leads or offering the slightest danger to employees.

### Secondary Power and Light Distribution

From each splice box in the cellar floor, feeder taps are taken from the power loop to a specially designed 3-phase, 4-wire column-type dead-front safety-fuse main distribution panel. These panels are mounted on the row of columns running down the center of all buildings, and are connected with the splice boxes by standard conduit elbows set in the floor slab. Lighting feeders are run from the distribution panels vertically up each column to the attic, picking up a lighting panel on each floor, each panel feeding the full width of the building for a distance of 24 feet.

Laboratory power feeders are run vertically up each side wall on 12-ft. centers fed from alternate main distribution panels, picking up 50 ampere circuit breaker cabinets on each floor. The 50-ampere circuit breaker is not in-



LOAD CENTER showing 4000 volt feeder selector switchgear at left with Cory interlocks, secondary air circuit breaker and metering panel at right with 200 kva. transformer in center.

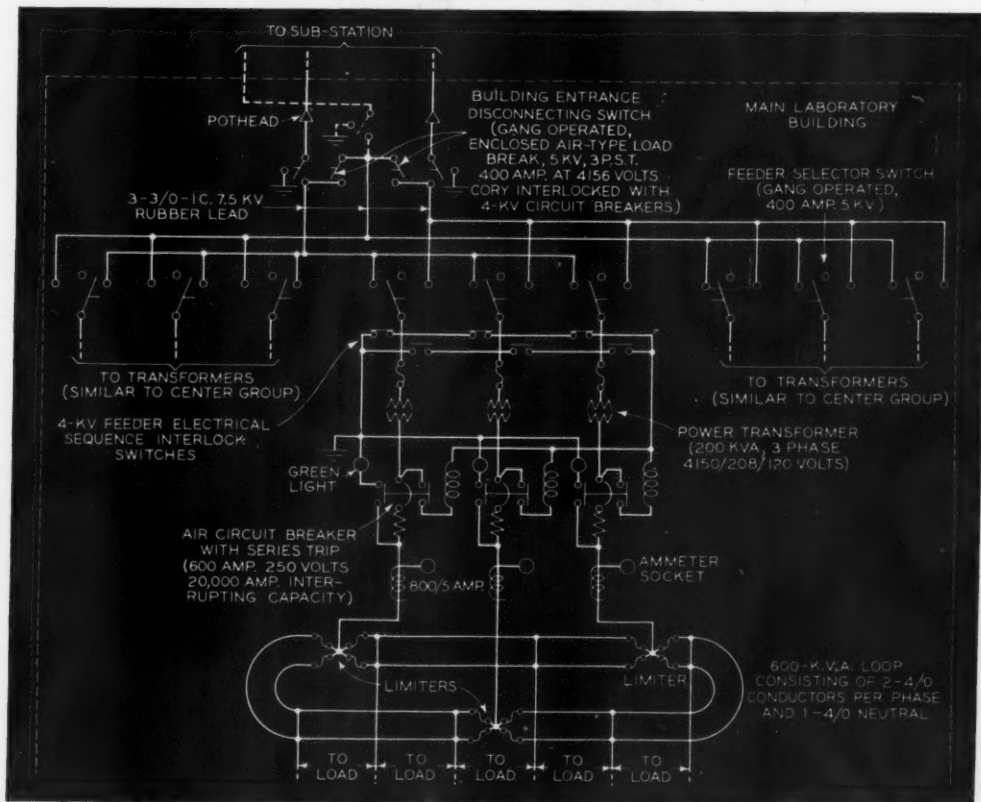
stalled if an area is used for offices or space not requiring power, but provision is made for inserting the breaker when the area is converted to laboratory use. Each 50-ampere 3-pole circuit breaker supplies laboratory power to approximately 300 square feet of floor

space, which is equivalent to 60 watts per square foot.

To meet the requirements of flexibility in space assignment, the buildings have no permanent partitions except around stairwells, elevator shafts, and

[Continued on Page 80]

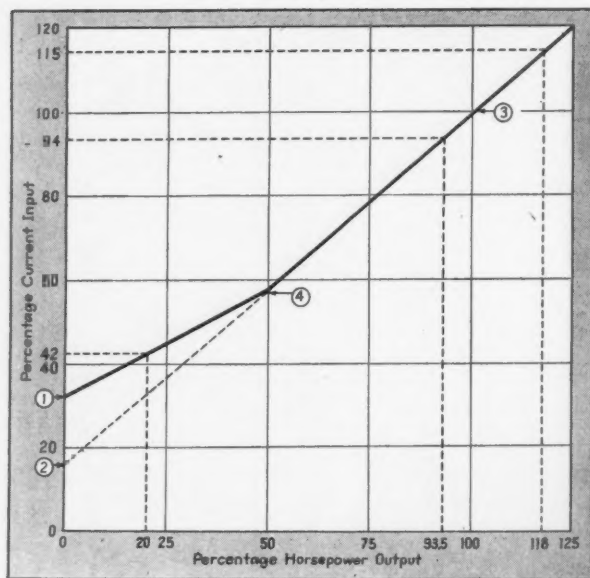
BUILDING distribution system in single line schematic showing Cory interlock system.





# HORSEPOWER Quickly Determined

Output of squirrel cage motors can be determined from input current as measured by ammeter



HORSEPOWER AND CURRENT are both plotted in percent of full-load. Read the current which the squirrel cage motor is drawing by means of a tong ammeter. By projecting this current value to the curve and down to the horsepower ordinate the output to the load can be quickly determined. This curve has been drawn for a 60 hp., 3 phase, 440 volt, 1200 rpm., motor with a no-load current of 24 amps. which is 32 percent of the full-load current of 75 amps.

INPUT CURRENT is being measured to determine the horsepower output by use of the accompanying curve.



spotted at 1 in the chart. Half this value or 16 percent is spotted at 2 and the full-load current-horsepower point is spotted at 3. Then 2 and 3 are connected by a straight line and where this line crosses the 50 percent horsepower line, point 4 is spotted. Now 4 and 1 are connected and the curve used is from 1 to 4 to 3. The motor is then loaded up and another test is taken with the tong ammeter. This time it reads 31.5 amps. which is 42 percent current. Running horizontally over from 42 percent current to the curve and dropping vertically to the horsepower ordinate, the output is found to be 20 percent which is 12 horsepower.

Another test is made under heavier loading and the current is found to be 70.5 amps. which is 94 percent current. The corresponding output is found to be 93.5 percent or about 56 horsepower.

Extending the curve for overload, a current value of 86.2 amps. would be 115 percent full-load current and the corresponding horsepower output to the load is found to be 118 percent or 70.8 horsepower.

It will be noted that the current per horsepower output is higher below the half load point. This is due in part to the fact that the iron, copper, windage and friction losses consume a greater percentage of the total input current. Low power factor is responsible for more wasted current when the motor operates under half load. In other words, at no-load the motor output is zero and the input current is 100 mechanical loss. From this it can be seen to be well worthwhile to keep all motors as fully loaded as possible. In considering the overall plant efficiency, quite a power-bill saving can be made if a greater percentage of purchased current can be put to useful work and less to losses and wattless power. This wasted energy should and must be curtailed.

**T**HE actual horsepower output of a squirrel cage motor can be found quickly, easily, and quite accurately with only the use of a hook-on type ammeter. The applied voltage must, of course, be the rated voltage of the machine; otherwise current readings will be greater or lesser as the voltage is respectively below or above rated voltage. Since percent power factor drops off considerably when a motor operates below half load, a constant check of motor outputs should be maintained to determine advisability of replacing underloaded motors with smaller ones which will operate more nearly at the full load point. Nick Dragics, Electrical Engineer of Fiberglas in Newark, Ohio, recommends this method for checking squirrel cage motor loads in the plant.

Current in percent of full-load is plotted against horsepower in percent of full-load. Only the no-load current in percent need be known. This can be found by the use of a clip-on am-

meter with the motor running idle. It is generally easy enough to throw off the belts or to disengage the gear and pinion for this quick test. Or the no-load current value may be known.

Spot this percentage current value on the 0 vertical horsepower line. Then take half this value and spot it also on the 0 horsepower line. Connect this half value point with the 100 percent current—100 percent horsepower point by a straight line. Where this line crosses the 50 percent vertical horsepower line spot another point, and connect it with the no-load value point by another straight line.

## Example

Take a specific case. A 60 hp., 440 volt, 1200 rpm., squirrel cage motor has a full-load current rating of 75 amps. which is taken as 100 percent. The belts are thrown off the pulley and a no-load test with the tong ammeter shows 24.0 amps. which is 32 percent of 75 amps. This value is





NEW CABLE-DUCT installation showing main turret ducts which top the main switching turrets.

## Welded Cable Ducts

Closed ducts for interior distribution of telegraph and power cables made by welding process

**T**HE distribution of many hundred cables in a large telegraph office requires much planning to route the cables in the most direct path over the shortest distance, to determine the means of carrying them, and to arrange the cables in such a manner as to avoid cross-overs and entanglements.

In years past the open flat-iron ladder style cable rack was used. This method necessitated tying each cable to cross straps at 10-inch intervals. An improved closed duct system was designed which is a great improvement over the ladder-style open cable rack in appearance, and at the same time protects the cables from dust, mechanical injury, and other common hazards.

The main turret duct which tops each switching turret was designed to enable cable groups to drop from one side into the turret jack rows, to permit other cable groups to rise from these turret jack rows to the other side of the duct and to permit still other groups of

direct cables to pass through to their individually assigned turrets. End turret ducts, offsets, goosenecks and various other curved and straight ducts to accommodate the particular requirements completed the installation. The design of the fabrication of this system, includ-

ing the reinforcement members, was made possible through the basic use of the arc welding process. The use of rivets or bolts for the primary fabrication would have made the installation costly and burdensome. The over-all installation saving realized through the use of welded duct over the old ladder type cable racks figured to approximately 63 percent.

Comments and reports have come from various sources pointing out the five main advantages:

**RACK—100 hours DUCT—30 hours**

Cost in dollars to manufacture each turret cable rack unit as compared with equivalent duct unit.

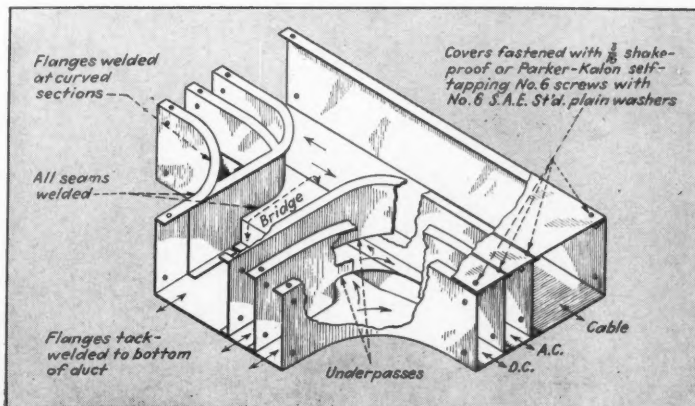
**RACK—\$13.00 DUCT—\$15.00**

1. Simplifying installation of ducts and cables.
2. Greater ease in finding any faulty cable.
3. Eliminating dust and dirt from cable banks.
4. Protecting cables from external injury.
5. Beautifying of a huge telegraph office.

### Cable and Power Ducts

In rendering telegraph service to large private companies by which telegraph communications are transmitted to and

[Continued on Page 127]



From a study submitted to the James F. Lincoln Arc Welding Foundation by Harry J. Eiermann, Engineering Dept., Western Union Telegraph Co., New York.

From plan to final assembly, lighting is the constant aid to skilled hands and machines in aircraft production. These photos from major aircraft plants show some of the modern illumination methods used.



## LIGHTING PLANE PRODUCTION





#### ABOVE

FINISHED LIGHTING in a warehouse section, 625 ft. long, 160 ft. wide, with 35 ft. head room, having a mezzanine 40 by 325 ft. Lighting fixtures contain four 40-watt white F lamps; are suspended from horizontal pipe supports.

#### TOP RIGHT

DRAFTING ROOM with a big template loft adjacent is lighted to 35 foot-candles by 4-lamp fluorescent fixtures in rectangular boxes with diffusing glass over the bottom, suspended from wooden beams which carry the conduit and outlet boxes on top.

#### CENTER RIGHT

TOOLMAKERS SHOP lighted with 4-lamp fluorescent units suspended from pipe rails. Panels for lighting and motor control are located at the columns. Feeds to the motors are usually run in troughs in the concrete floor.

#### LOWER RIGHT

OFFICES ARE lighted with a more ornamental fluorescent 4-lamp fixture equipped with translucent diffusing glass. Business machines are fed from numerous floor outlets in rows and available to machines at almost any placing.

#### LEFT

TWENTY-EIGHT MILES of light were installed in this new plant by contractors R. R. Jones of South Pasadena and Commercial Electric Co. of Los Angeles. To mount them 45 ft. above the floor, contractors used movable scaffolds on which two men could work.







ARMATURE WINDER, *Lillian Dickerson*, mastered the operation of the armature winding head. Loose ends don't puzzle her.



COIL WINDING is the specialty of *Estalene Braden*. She could switch to armature winding in a minute, if necessary.



HENRY CALDWELL shows how magnet wire stocks are kept at floor level to eliminate heavy lifting. Reels can be rolled into position.

## SMALL SHOP

"**W**E'RE still on top," remarked Henry Caldwell, proprietor of the "C" Electric Co., Cincinnati, Ohio, as he surveyed the work on hand and his four-girl crew turning out the repair jobs. He admitted having a slight case of leaping jitters when the pinch came and had to think fast and act quickly to stay where he is.

When the war started, Henry was in business about two years and was doing right well. But he had a young organization, all employees being under 25 years of age; and he was handling relatively small work—motors up to 10 hp. in size. With the curtailment of non-essential industry, restrictions on materials, and the draft, he saw difficulties in the offing.

His first concern was to maintain the flow of incoming business—as much of it as possible under essential classifications. He solved this problem by going to larger repair shops and offering to subcontract their small motor repair work. The shops cooperated with him, being glad to get a reliable firm to take part of this load off their shoulders and release more of their time and manpower for the larger jobs swamping their books. The "C" Electric Company is now doing this type of subcontract work for six of the larger shops in the Cincinnati area.

Everything went along fine until the draft made inroads on the shop personnel. It's pretty difficult for





FINAL COACHING—Cyril Betzweiser, now in the Army, shows Della Riley the fine points of stator stripping.



STATOR WINDING comes easy to Josephine Simms, who is rapidly learning shop terminology.

## P SUBCONTRACTING

**This small motor service shop sidestepped being a war casualty by tying-in with essential work and replacing its drafted personnel with women**

a young shop to hold on to its men, especially if they are of a ripe draft age. So, one by one they were called. A critical stage developed when Henry saw that he would lose five of his seven men to the armed services. Once again he had to act quickly to save his business.

### Hires Girls

He did what every industry has already done, or will be forced to do in the immediate future—hire women. It wasn't expedient to hire a woman to do just coil winding, tapping or other single operations. He had to have them to do all phases of the work. He contacted the United States Employment Service, asked for—and got—four

young girls without previous experience but who, through USES tests, proved they had mechanical aptitude. He preferred young girls because he assumed that they would be easier to train and would have fewer domestic responsibilities to distract them from their work.

Apparently his formula worked. In three months time the girls have mastered the mechanics of armature and coil winding, motor stripping, insertion of coils and connections on simpler motors. Every operation is carefully checked and rechecked. By learning all phases of the work, the girls can be switched from one operation to the other so occasional absence or illness will not interfere with production.

In the interim, he gave them small doses of basic theory to clarify the mysteries of electricity and the electric motor. After this was absorbed, they were given fundamentals of shop practice. In fact, he had to restrain them somewhat to prevent them from advancing too rapidly. Some already were anxious to operate the lathe. But his plan calls for a slow and thorough orientation into shop methods and motor repairing. He wants them to know thoroughly the "why and how" of their jobs.

Of course, some shop changes had to be made. Washroom facilities had to be built and wire stocks and heavy parts rearranged to eliminate any heavy lifting. However, to a small shop this is a minor item.

The "C" Electric Company is a new member of NISA, reaping the benefits of that association's vast store of experience and shop knowledge and keeping abreast of government regulations through its services. Here is an outstanding example of a progressive small shop that refused to give up the ghost without a struggle; solved its personnel problem; and, through subcontracting, found its place in the war effort. It shows what other small shops, who find themselves in similar circumstances, might do.

# Editorials

W. T. Stuart, Editor

## Reservoir of Spare Capacity

Directives from WPB have concentrated on the application of new motors and rightfully so, for control over installations already made is practically impossible. Consequently it is up to the maintenance organization to help solve this acute shortage of critical materials. The amount of material which can be saved by re-rating motors for new application is actually small compared to the savings possible by juggling present installations.

Recommendations have been made to increase loading, but in the majority of instances loading cannot be varied at will by a mere twist of the wrist. Thus this vast reservoir of reserve capacity that has been built up over the years from the application of safety factors in original design and manufacturers built-in service factor, is seemingly out of reach.

For instance, a compressor was installed several years ago to perform a specific job. Production required and still requires only a certain volume of fluid and no more. The 125 hp. driving motor is only drawing 96 hp. average with 112 hp. for peaks. Thousands of identical cases can be cited.

To remedy this situation is not an easy task, but it is far from being impossible. A thorough study must be made of charts taken with recording meters of every motor in the plant. A general move-up can then be made with smaller motors being moved in to take over larger loads which had previously been over-motored. Very often it will obviate the necessity of buying large motors. In any case the savings of critical material are tremendous. By bringing up the average loads on the plant motors, a very

marked increase of power factor will be effected with its resultant conservation possibilities. Increased power factor means released capacity of switchboards, buses, feeders, transformers, and generators. Power factors have been increased 20 percent and 30 percent by merely juggling the motor load to bring each individual drive up to capacity. The value of such a move on the part of the maintenance organization to the war effort cannot be over-emphasized.

## Trophy Cases

All too often, we look upon the cabinets in which we keep our testing instruments as trophy cases. If asked about our facilities for making electrical tests we point with pride to a polished veneered cabinet full of nice new-looking meters of all types. An industrial analyzer, which only the boss himself can use for anyone else might jar it out of calibration, indicating voltmeters and ammeters, shunts galore, recording wattmeter-ammeter-voltmeter, potentiometers, current and pot transformers, power factor meters, Meggers, and such. "Not a scratch on any of them. Have you ever seen a better accumulation of meters?" The answer is, of course "No." But they might just as well be loving cups.

Instruments are valuable. They deserve reasonable care. They can be ensconced in prim security behind locked cabinet doors. Once the crew is thoroughly impressed with the enormous value represented and the wrath that will descend upon the one who might jar one out of calibration it is reasonably certain that they will last a long time unmarred by caloused thumbs or careless tools.

However, instruments give information about electrical systems and equip-

ment that means much more in dollars and cents than the intrinsic worth of the meters. They can't give information in a locked case. They ought to be out where the men who know how will use them freely.

A case recently came to our attention where the foreman of an electrical crew who could casually dispatch several hundred dollars worth of tools by a phone call to the tool room, had to file a special requisition and sign personal responsibility for damage in order to obtain a fifteen dollar voltmeter. The instruments were classified as laboratory apparatus.

Every shop should have a set of meters that can be dispatched to the job as easily as other tools for that is exactly what they are. The only possible way to expect dividends from an investment in good meters is to put them to work. As long as they remain on the shelf they are merely a liability. They become valuable assets when applied to the job.

## More Code Revisions

In the News section of this issue a new group of Code changes are announced. They are the proceeds of the fifth meeting of the Emergency Committee which has the job of keeping our safety rules geared to the special problem of war. Again the amendments reflect careful thought, and a ready willingness to accept new materials and methods where the conservation in critical materials justify emergency rules.

Several of the new Interim Amendments are minor adjustments to eliminate conflicts caused by previous rules. No. 80 eliminates a possible conflict on rules referring to cranes and hoists. A discrepancy between published reports on No. 55 and the Supplement has brought action to approve the Supplement version as representing the intent of the committee.

Evidence of close cooperation with WPB in carrying out conservation rules is apparent in No. 72, which is revised to permit increasing the rating on separate over-current protection to motors; permitting No. 8 unprotected ground wires at WPB request under No. 81; rating SBW and SB wires for open installation under No. 77 and permitting No. 18 steel for cabinets.

To keep those who must live with the Code up-to-date on the new rules

a new Supplement was recommended and will probably be forthcoming in the near future.

It is increasingly evident that the Emergency Committee procedure has sufficient speed to handle the extraordinary problems of wartime and still provide real protection to Code fundamentals.

## Sievert Goes To Washington

One of the perennial protests of business against government war bureaus is that the staff men are not up to the caliber of the responsibilities they must handle. And government barks back that they asked industry for top men and took industry's counsel in filling the posts.

There need be no concern on either point about the new Chief of the Used Equipment Section of the General Industrial Equipment Division, WPB. Carl A. Sievert, president of the Sievert Electric Company of Chicago, long so active in NISA activities that more identification than his name is unnecessary, has just been appointed to that post. He will have the job of directing applicants for motor priorities to the sources of used motors.

As the top man of a prominent motor shop, Carl Sievert takes mature responsibility, able experience and the invaluable know-how of his industry to a difficult job in WPB.

## Copper Scrap Vital

Copper scrap is the primary industrial salvage problem of 1943, although iron and steel scrap collections must be maintained at high levels. The concentration on copper salvage will of course throw the responsibility onto the shoulders of the electrical maintenance man and the contractor. It offers a golden opportunity to prove to ourselves and to our government that not only can we successfully carry the burden of keeping production up to peak by maintaining production equipment, but also that we can do our share in returning scrap to the mill which will feed raw material to that same productive equipment which we maintain.

Copper in any form and brass and bronze castings such as bearings,

cams, pinions, housings, tubing, wire, cable, etc. are especially valuable right now. But let's not make our salvage campaign a one day or a one week job. It must be for the duration.

Set up a line of responsibility in your organization. Specify a certain man or men to ferret out copper, brass and bronze scrap. It is needed very badly and needed now. And its influx to the mill must continue until the war is won. It is vital that we turn this into a continuous program. Don't neglect the slightest opportunity regardless of the extent. The electrical industry is huge. Every piece counts. Make provision for its collections and get in the scrap.

## Tax Debt

In the efforts of Congress to produce an income tax bill suited to the times and to the sizable share of the individual's income that it now claims, debate has succeeded in clouding some simple issues.

The Ruml plan is talked about as "forgiving taxes" or as "skipping a year's taxes." But the principal feature of the plan is that it skips a year, not of taxes but of the tax base. Then by collection at the source the spectacle of enormous nation-wide tax debt disappears.

And this is the real issue in "pay as you go." Whatever device is concocted to make the shift, any plan must consider the evil of tax debt and operate toward its immediate elimination. The Ruml plan is the simple, obvious answer, much too simple and practical, perhaps, for the technical purists of the Treasury.

As it is today the Treasury does not carry income taxes due as an asset, yet realistic bookkeeping forces the individual to carry his taxes as a liability. He is forever in debt for a year's taxes. And the spectacle of a whole nation perpetually in debt to itself is ridiculous.

The fundamental error was made when the income tax was started. It has become increasingly vexing as the tax rates have increased. There is nothing sacred in the principle of paying a year late just because it seemed a good idea back in 1913. Let's get rid of tax debt and get started on a practical current basis of assessment and collection.

## Washington Comments

Looking over the Washington scene during the past month, there are some fairly clear predictions that can be made with the usual hedge that the progress on the fighting fronts is the only true guide to the future.

Regression of the war building program is lopping off a sizable chunk of the 1943 construction prospects, a curtailment, however, from an enormously large total. Even if the cuts are accelerated during the coming months, 1943 will wind up far above normal in construction totals.

WMC is going through a period of severe criticism. Individuals will be pushed around but long-term plans will be carried out on schedule. The various devices used to obtain public cooperation will be just as drastic as are necessary to attain the goals already set.

Liberalized rules to allow utility extension to farms do not yet include materials for wiring on the premises. If available inventories are not adequate some specific priority status may be extended.

Salary ceilings will be lifted and rules on all wage brackets given some further flexibility. Wage control policies, however, will be kept tightly reined. The Little Steel formula will go in all probability.

No important congressional changes in selective service are in the cards. Men in 3-A will be in basic training by summer, few permanent deferments will be granted for any reason. Army particularly wants all men 18 through 30 regardless of essential or dependency status and will probably get them. High rates of rejections in 3-A group will probably result in lowered physical standards.

Industrial, commercial and residential service and repair equipment will be easier to get after CMP gets into its stride.

East Coast areas are in for drastic cuts in gasoline even to complete stoppage for a time to permit diversion of all available supplies for invasion.

The social security number on income tax return hangs on a tag on \$1100 workers, floaters who make a practice of changing jobs before they earn enough to require employer reports. Nevertheless the job of chasing down itinerant workers who make no report will be difficult. But it will be done.



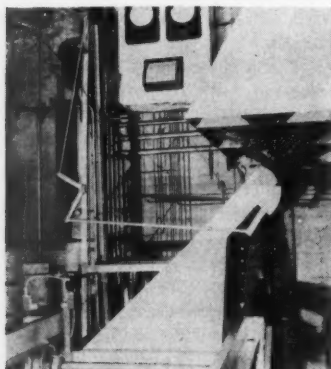
# Methods

**BRIEF ARTICLES** about practical methods of installing and maintaining electrical wiring and equipment and up-to-date estimating and office practices. Readers are invited to contribute items from their experience to this department. All articles used will be paid for.

## PHOTOELECTRIC RELAYS CONTROL COAL LARRY

INDUSTRIAL

At the Adolph Coors Company, Golden, Colorado, G.E. photo-electric relays play an important role in controlling the movements of a larry which



*PHOTOELECTRIC relays also control the movements of the larry when it requires refilling. One of the uprights is let down out of the way to allow the larry to run a distance of some thirty feet to the coal bin, where a similar upright intercepts the light beam, thus stopping the larry.*

evenly distributes coal to a sectional hopper feeding a chain grate boiler.

Photoelectric relays were installed on this equipment to replace limit switches, since it was felt they would prove more lasting as well as eliminate the various mechanical changes involved.

As the larry, which is essentially a large movable coal bin, oscillates slowly back and forth on an overhead track in front of the hopper, hinged vertical uprights in the center of the track between the rails intercept the light beam from the photoelectric relays, which are mounted at each end of the larry, as it reaches the limit of travel in the forward and reverse directions. Thus the larry is prevented from traveling too far in either direction.

Furthermore, an electronic time-delay relay permits the larry to come to a smooth stop, which would probably not occur if the motor were plugged.

## SOLDER SALVAGE

INDUSTRIAL

Salvaging critical material could probably be effected in many places of our daily operations if only we could think of them. Sometimes we do think of them but brush them aside with "it doesn't amount to much." But it does amount to quite a bit in the long overall picture.

H. S. Bishop of the Submarine Signal Company suggested that a box be placed

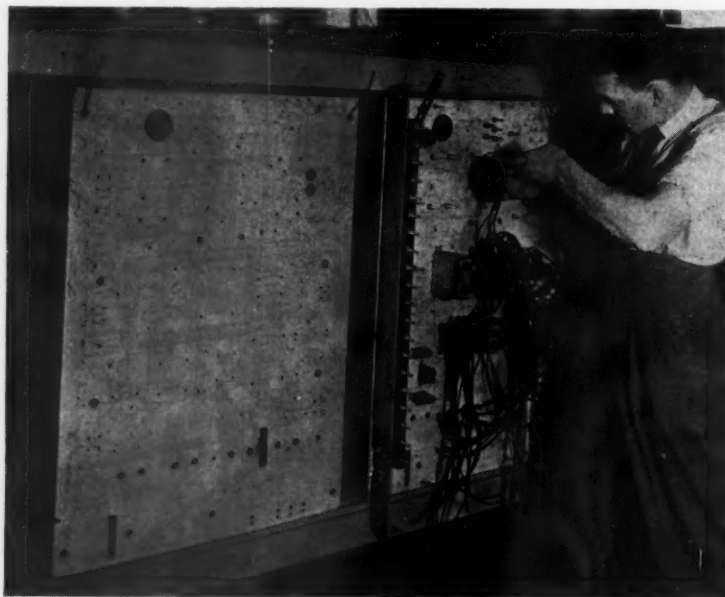
at benches where soldering was done. All solder drippings, no matter how small, was to be placed in the box. Everyone cooperated faithfully and at the end of six weeks a total of fifty pounds of solder had been collected, solder which in the past had been swept away.

## WIRING TEMPLET SPEEDS ASSEMBLY OPERATIONS

WIRING

At General Electric many thyatron resistance welder controls are being produced for the precise control of resistance welding machines on war production. An aid to the quantity production of these controls is the pasting of oil-resistant paper wiring templets to the back of the panel. This arrangement simplifies the drilling of holes in the panel and speeds up assembly by indicating exactly where all parts must go on the panelboard.

Shown here is a workman assembling one of the panels; to the left is a panel as it comes from the drilling operation. All the workman has to do is fasten the many parts in their respective places and connect the wires as indicated on the templet. He can leave the panel temporarily and take up the assembly later without hesitation, or someone else can take over for him. When completed the assembly and wiring can be checked almost at a glance preparatory to test.



*IN ADDITION to speeding production of this much-needed equipment, this arrangement helps simplify the maintenance job at the plant where the control is installed.*



Timely tips  
from  
the Wartime  
Lighting Front

# Salesgram

BOB BISHOP  
SALES MANAGER

## SYLVANIA

ELECTRIC PRODUCTS INC.  
Salem, Mass.

Incandescent Lamps  
Fluorescent Lamps  
Fixtures, Accessories  
Radio Tubes  
Electronic Devices

### Thinking out loud:

ABSENTEEISM IN WAR PLANTS is a big worry. Wonder if plant lighting has anything to do with it. Might. Long hours of work under inadequate light make for eye-strain -- eye-strain makes headaches -- headaches may make absentees . . . And there are a great many older eyes that need the best illumination possible in plants all over the country. We know how important scientifically planned illumination is to plant safety. Why isn't it just as important in attacking the problem of absenteeism? We haven't had time to make any surveys, but we do know of individual work records in fluorescent-equipped plants that are much better than in industry in general. How about asking some questions and letting us know if this is a good sales hunch? LESS ABSENCE WITH FLUORESCENCE might be a slogan.

COMMERCIAL FLUORESCENT FIXTURES manufacture continues -- because it steps up war production office efficiency -- for accounts rating priority of A-1-J or better.

Speaking of which, NEW COMPOSITION REFLECTOR fluorescent fixtures not only are going to town now but seem to be here to stay. Probably because it is "as light as light can be" in more ways than one. New Sylvania design gives 86 per cent reflector efficiency -- greater than that of prewar porcelain enameled metal. And it's lighter in weight for servicing.

POSTWAR NOTE: Fluorescent lighting and electronics have a bright future. Fluorescent lighting will be extended from the war plants of today to the homes, stores and offices of tomorrow. And the peacetime applications of electronics to life and work have an unlimited ceiling.

FLUORESCENT WILL MARRY PLASTICS SOON -- a notable union of two products of tomorrow. Watch for plastic end caps on fluorescent lamps! This move toward the future will help to conserve some 62,000 pounds of alloy metals to help win the war.

LUMILINE LAMP PRODUCTION is in your lap. Turn-in plan only way to reclaim vital metals necessary to guarantee continuation of production. Don't turn them out -- turn them in.

*Another "Power" the Axis forgot...*



## OUR POWER MAKERS

*whose electrical output is the Lifeblood of War Production*

If you haven't already done so, Herr Hitler, you had better scrap your intuition. For in your carefully laid plans for world conquest, it has failed you once more. It has failed to warn you of a "Power" more formidable than any you have yet faced. That "Power", Herr Hitler, is electric power, American electric power, the power behind American production—the power that has met and will continue to meet every demand from our American factories geared to relentless war for Victory.

Electric Power has now become the yardstick of a nation's capacity for war. Here in America ours is almost limitless; thanks to the foresight of our power makers, the supply of electrical energy has always paced demand. It is not an accident that every war plant in America that needed more electric power got it when and where it was needed.

Forward planning has always been a characteristic of the utility industry. It has never waited until a demand for power developed. There has

been the job of anticipating demand and being "Johnny-on-the-spot" with adequate facilities so that when a switch was thrown, there was power available in the quantity needed. That is why America's war producing machinery went into high gear so soon. That is why the "Power" Hitler forgot is now making itself felt on all fronts, and will continue to increase into a mighty crescendo of thundering tanks, planes, guns and ships to overwhelm and completely destroy the evil forces that would enslave us.

## GENERAL CABLE CORPORATION

MANUFACTURERS OF BARE AND INSULATED WIRES



AND CABLES FOR EVERY ELECTRICAL PURPOSE

G E N E R A L C A B L E



This is the fourth of a series of advertisements sponsored by General Cable Corporation, depicting the role the Electrical Industry and industries closely allied with it are playing in the war effort. A message dealing with the Contractors' Vital War Service will be published as a part of the series.



*This advertisement appears in the leading influential newspapers of the country...a continuation of the General Cable series.*



**General Cable Corporation Sales Offices:** Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Kansas City (Mo.), Los Angeles, New York, Philadelphia, Pittsburgh, Rome (N.Y.), St. Louis, San Francisco, Seattle, Washington (D.C.)

E C O R P O R A T I O N

# The Navy conserves for Victory

*Won't You?*



Same size . . . Same appearance  
*But one saves Critical Copper*

TO specify automatic magnetic starters for motor-driven equipment where manual control will do the job is to insist upon convenience at the expense of our stockpiles of critical materials and to jeopardize the outcome of this war. As an example of the tremendous Victory contribution made by the substitution of manual for automatic starters, on just one group of orders alone for the Navy this simple change saved 450,000 lbs. of copper and steel and thousands of manhours, and the Navy got the equipment up to 6

months earlier. The Navy is conserving for Victory. At the request of the War Production Board, the entire Electrical Industry has adopted this conservation policy. Apply this principle in your plant and in your purchase of electrical equipment. The choice is clear. We will have enough critical raw materials to win this war only if we restrict our demands elsewhere to the barest necessities. . . . CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee, Wis. Associate: Canadian Cutler-Hammer, Ltd., Toronto, Ontario.



Copyright 1943, Cutler-Hammer, Inc.

*Methods*

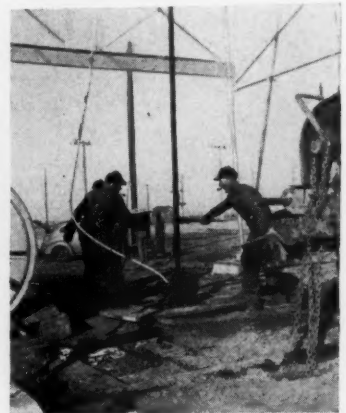
[FROM PAGE 42]

This idea, simple as it is, can easily be applied to many other projects involving complicated wiring systems.

## PUMPING VOLUME DOUBLED

INDUSTRIAL

Operation was unprofitable at one oil well in the Elbing pool, Butler Co., Kansas, because of increasing water percentage. Installation of an electrical centrifugal submersible pump doubled



**WORKMEN** running tubing into a well for the pumping operation.

the oil output at no additional operating cost, even though 3,230 barrels of water a day had to be lifted. The complete unit is lowered below the well fluid level and electric power is supplied through a cable clamped outside the tubing string.

## IDENTIFICATION FOR ELECTRICIANS

MANAGEMENT

In large industrial plants, shipyards, mines, etc., electricians are generally at a premium. In many incidents the electrician may be some distance from where trouble actually occurs, or then again he may be passing unnoticed from another job. Consequently it has been suggested by C. R. Sampson of the Bethlehem-Fairfield Shipyards that electricians in shipyards be given helmets identified by color or shape so that they may be more easily located in time of trouble. Often when the services of an



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USTRIAL

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# 1941

The "contact" that calls in the nurse . . . Quickly, silently, her fingertips bring her instant service. Edwards hospital communications are typical of the peacetime equipment that brought added efficiency to thousands of institutions, homes and factories throughout America.



# 1943

The "contact" that caves in U-boats . . . The shark-like shadow is sighted. The command is given. An Edwards device activates the Y-gun . . . And depth charges doom one more Axis marauder. This is typical Edwards wartime equipment for Army, Navy, and Merchant Marine.

## 194? How does a Y-Gun fit into your future?

● As American sub-chasers lash through Axis-infested waters, the Y-gun is the grim sentinel that stands guard over Allied shipping. Today, the Y-gun looms in importance in your life. It brings peace just one step nearer. But, here's what it means for tomorrow . . . the Edwards engineering brains that created the Y-gun contact switch and many



other high-speed communications of war will be ready, at a moment's notice, to contribute to the blessings of peace. Amidst 100% war production, Edwards' Post-War Research steadily progresses to assure the mass manufacture of improved communications equipment, signal and alarm systems for peacetime America. Edwards and Company, Norwalk, Conn.



# EDWARDS

SINCE 1872  
Communication Equipment for  
Homes, Institutions and Industry

Electrical Contracting, April 1943

[FROM PAGE 46]

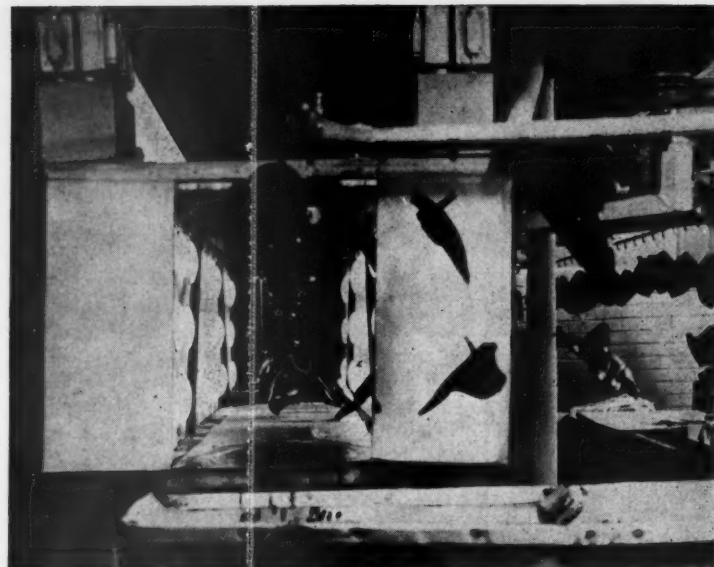
electrician cannot be obtained immediately some important operation is halted with the resultant loss of many man-hours of important war work. This suggestion can be carried into any industrial plant or mine by giving some type of identification to the electrician so that he may be quickly recognized. The old adage "a stitch in time saves nine" may very well be applied here.

## MILEAGE RECORDS

## -RECORDS

Truck mileage and local records are required by O.D.T. Certificates of War Necessity. To assist its members in keeping adequate records, the Minnesota Electrical Council, Inc., Minneapolis, has prepared a simple record card 5-in. by 8-in. that can be carried in each truck or car. The drivers can quickly jot down the necessary information.

The cards, which can be used either for a daily record or as a continuous record to be totalled for quarterly periods for entry on the Certificate of Necessity, are printed on 24 lb. buff paper with 50 sheets stapled to a cardboard backing. Each sheet is perforated so it can be removed and turned into the office at regular intervals after it is filled out. The association also sells these forms to any non-members who might want them.



**DRYING AIRCRAFT PARTS**—All down the production line of the Cessna Aircraft Company at Wichita, Kansas, from the stock room to final assembly, proper light is being used to help get these twin-engine trainers completed on scheduled time. In a few instances, unusual use is made of light to solve specific problems. One of these is in the paint shop. Here it used to take 16 hours to dry enamel on cylinder baffles. Now using the 250-watt G-E R-40 drying lamps the time has been reduced to 25 minutes. Space has been conserved and the finished job is much better done.

## LOCATING BREAKS IN HEATING PADS

## —WIRING

An extremely simple and effective method of locating breaks in the electrical heating elements of electric pads is used by John J. Wack, Wack Electric Co., Council Bluffs, Iowa.

Since the element is covered by a thick pad, it is usually difficult to find the ruptured portion. John uses an ordinary neon sign transformer with a 3,000 volt secondary which is connected to the heating pad cord. Wherever there is a

break in the circuit a spark will occur. If left on for a short time, a small column of smoke will arise from the pad, revealing the broken element. John then digs in and splices the break.

The scheme is quick and safe and does not damage the pad.

## SPOT AIR CONDITIONING SPEEDS PRODUCTION

## -INDUSTRIAL

"Spot" air conditioning is increasingly used for such things as special manufacturing processes, laboratories, testing rooms, and store rooms for instruments and perishable supplies. Often individual self-contained units are applied up to 25 tons.

A typical case is in holding constant temperature and humidity while cutting marine propulsion gears. At one plant, each of the precision hobbing machines are in separate insulated rooms and air conditioned by 25 units ranging from 2½ to 5 tons. Holding constant temperature throughout the continuous 17 day gear cutting period maintains the close tolerances. Similarly, low relative humidity prevents condensation on the gear and tools. From two to four men work in each room and outside air is introduced, mixed with room air and brought through the air handling unit to provide a proper working atmosphere.

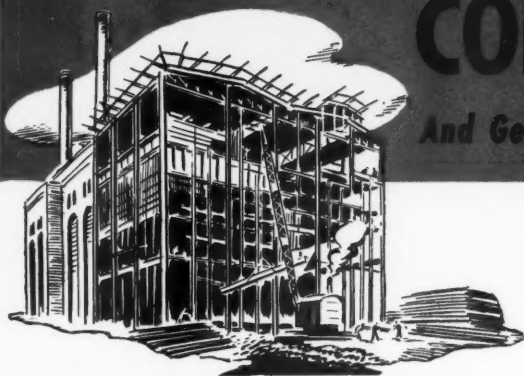
The rooms vary from 12 ft. by 16

[illegible]

**HANDY RECORD** cards, in pads of 50, permit truck drivers to daily record pertinent trip information required by Office of Defense Transportation regulations.

# HOW WAR PLANTS ARE SAVING COPPER AND TIME

And Getting **BETTER** Electric Power Systems



**E**XPANDING war plants today must get power systems quickly—and yet *save* copper and other materials. Application of the methods outlined here will accomplish both these results—and *also* provide a better-than-ever system. Here's how it is done—

## By Using Load-center Distribution

You can avoid long runs of heavy-copper secondaries by running the highest practical voltage direct to relatively small-size unit substations at the *centers* of the load areas, and save tons of cable copper.

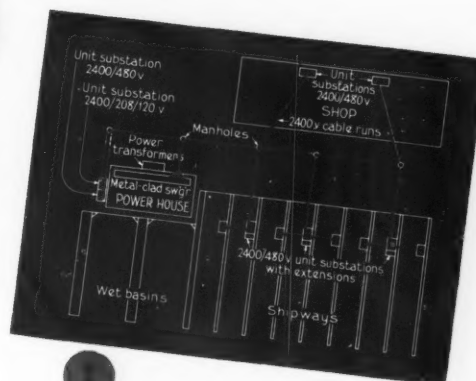
Installing substations at the *centers* rather than at the sides of square load areas requires 30 to 40 per cent less copper.

By using four small substations rather than one large substation to serve a square load area, you need only half as much cable copper.

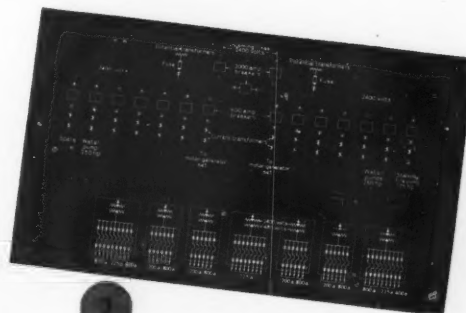
This is both practical and economical with modern safety-enclosed load-center units. These units, consisting of *Pyranol* transformers and *metal-enclosed* switchgear, can be safely installed right in working areas. Bulky, expensive vaults are unnecessary.

## ... And by Ordering STANDARD SAFETY-ENCLOSED Equipment EARLY

Standard means quick, easy selection and ordering. Safety-enclosed means an exceedingly high degree of flexibility as to location. Together, these advantages enable engineers to provide power in time to meet today's stepped-up schedules.



High-voltage is run directly to unit substations at load centers.



A simple one-line diagram is all that is needed for selection and ordering standard load-center unit substations and switchgear. This can be done when the plant or extension is in the first stage of construction.

Do This  
And ...

**GENERAL ELECTRIC**

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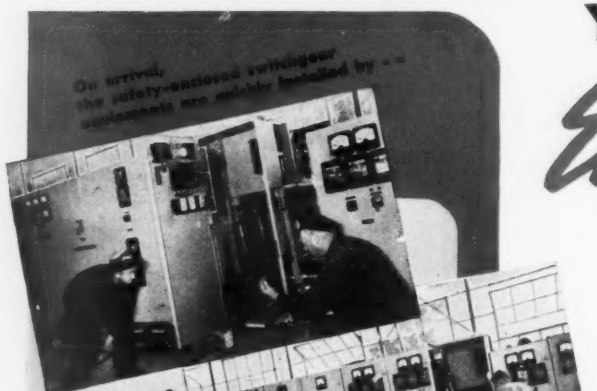
by 16

il 1943

UMI



# ... THEN YOU CAN INSTALL YOUR POWER SYSTEM *Early and Easily*



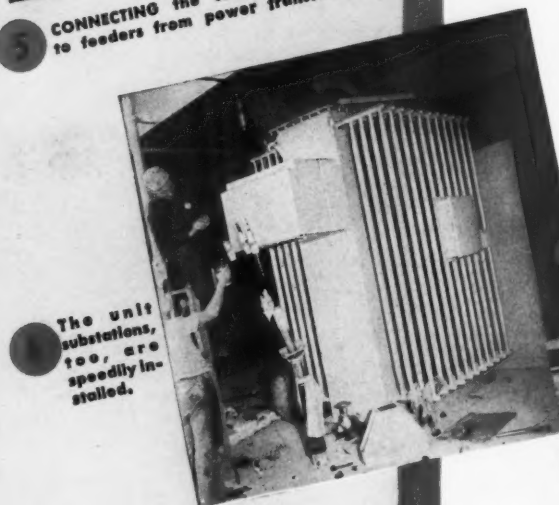
On arrival, the safety-enclosed switchgear equipment are ready for installation by —

1 SLIDING the units into their final position.

2 JACKING them down onto their slide, using a jack at each corner.



3 CONNECTING the complete assembly to feeders from power transformers.



4 The unit substations, too, are speedily installed.

INDOORS  
OR OUTDOORS



Safety-enclosed switchgear and load-center unit substations are completely factory-assembled, and are shipped in compact, easy-to-handle units that arrive all ready to be set in place and connected.

**THE SAFETY-ENCLOSED SWITCHGEAR CAN BE QUICKLY INSTALLED** simply by a "slide, jack, and connect" operation, as shown at the left. Each equipment is a safe, co-ordinated, unit assembly including circuit breakers, buses, and all associated equipment.

Because these compact units dependably perform any desired combination of functions, they save you the extra time and materials needed to select and install open-type exposed switchgear which necessitates long, wasteful copper interconnections.

**YOU CAN PUT IN THE UNIT SUBS JUST AS QUICKLY—INDOORS OR OUT.** On arrival, the transformer and switchgear sections of the unit substation are moved into position and bolted together. Connections are made to the incoming and outgoing circuits, and the unit substation is ready for service. Flexibility as to location of these safety-enclosed units is such that you can put them right at the load centers. In fact, they can usually be put in relatively valueless space—along column centers, on sub-balconies, and over washrooms.

GENERAL ELECTRIC



### EARLY INSTALLATION SPEEDS THE REMAINING CONSTRUCTION WORK —

Compact, standard unit substations—ordered early and installed the flexible, load-center way—have gone into service in scores of new or enlarged war plants weeks before construction was completed. In this way a ready, dependable supply of power is made available for all the power-driven tools and equipment needed to complete the construction. This eliminates the job of improvising a "temporary" power system that often presents a hazard to workers and is subject to power interruptions. It also eliminates a later change-over to the permanent system.

### —AND GETS PRODUCTION MACHINES ROLLING AS SOON AS POSSIBLE

Production machines need not stand idle waiting for an electric power system that couldn't be ordered until the building and the exact load locations "took shape." The flexible load-center system easily follows last-minute rearrangement of the machines, and can safely be ordered in time to arrive when needed.

From the very start, you get full protection for both production and personnel. The primary feeders are controlled and protected by metal-clad switchgear equipments so safe that workers can be located near them. Low-voltage feeders from the load-center unit substations are likewise protected by metal-enclosed drawout-breaker equipments that form an integral part of the unit substation.

*Now* —ADD UP

THE ADVANTAGES



*In this new war plant—*

7 The power system was installed in time for electric cranes to do much of the remaining heavy work during construction, and during installation of machines.



8 Load-center unit substations were ready to supply power for production machines, without delay.

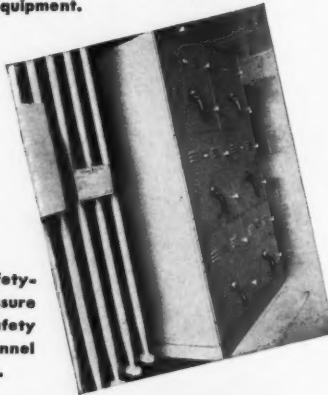


9 Metal-enclosed switchgear equipments were in service to control and protect all feeders to the unit substations, motor-generator sets, and pumps.

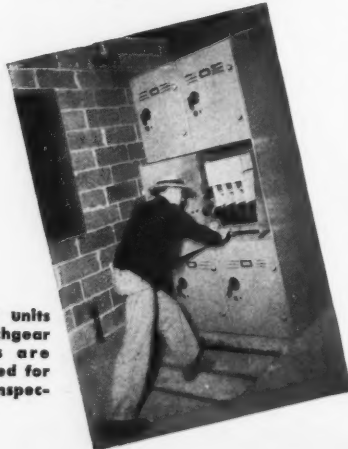
## Packaged load-center unit substations GIVE YOU THESE ALL-IMPORTANT SAVINGS



**10** Many tons of copper are saved by distributing power at primary voltage right to safety-enclosed unit substations at load centers—and the complete, permanent electric power system can be installed in less than one-third the time required to select and install piecemeal equipment.



**11** All units are safety-enclosed to assure permanent safety to both personnel and production.



**12** The breaker units of all switchgear equipments are easily removed for quick, easy inspection.

**COPPER**—When you replace heavy-copper secondaries with small-size primary cables, you save copper by the ton. Consider a 1000-kva, 4160/480-volt unit substation: For every foot that it is moved closer to the load center, you use 1.23 pounds of copper instead of 13.89 pounds. With many units and hundreds of feet, the copper savings soar.

You save copper within the units themselves, too. A typical unit of metal-clad switchgear uses only one-third the copper required by an open-type, piecemeal assembly for the same job.

**TIME**—In addition to the weeks you save by ordering safety-enclosed load-center units early, you save time by getting standards instead of specials—in a package instead of piecemeal. You avoid the preparation of detailed specifications, and long, drawn-out correspondence, when you select standard, co-ordinated units. You also save time installing the compact, easy-to-handle units.

### THEY ARE IDEAL FOR TODAY - - AND FOR TOMORROW

**SAFETY AND DEPENDABILITY**—Metal-enclosure of all live parts gives increased protection to both personnel and continuous high production in today's busy factory areas.

**EASY INSPECTION**—Load-center unit substations include drawout-air-breaker equipments that control and protect the individual low-voltage feeder circuits, and quickly restore service with a turn of a handle. The individual breakers can be easily withdrawn for inspection. Similar breaker units are completely interchangeable, so any breaker can be replaced with a spare in a few minutes.

The higher-voltage, metal-clad switchgear equipments (photos 3, 4, and 5) have vertical-lift breaker units that are similarly easy to remove and to replace with a spare during periodic inspection.

**FLEXIBILITY**—Safety-enclosed load-center units "go anywhere the load can." Their compactness makes them easy to move, too—whether it be a few feet or miles. This flexibility is valued highly by many engineers who realize that they may want to move power units to follow shifting, changing loads.

# GENERAL ELECTRIC

Schenectady, New York

## Methods

[FROM PAGE 48]

ft. by 16 ft. high to 38 ft. by 32 ft. by 18 ft. high and are of double steel construction with insulation between the walls. Each air conditioning unit has a heating and cooling coil; 13 evaporative condensers are used for condensing purposes.

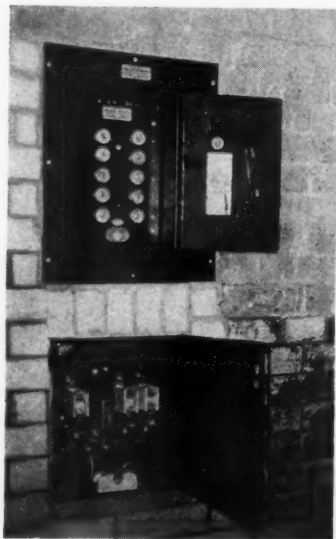
This is but one of the hundreds of industrial processes where this "spot" air conditioning serves war production. It is flexible, easy to install and adaptable to practically any process where a control of temperature and relative humidity are required.

### EMERGENCY LIGHTS REMOTE CONTROLLED

#### WIRING

The pressing of a single button at a newly rewired Chicago office building, recently taken over by government war agencies, will turn on emergency lights in all corridors and stairs. This button, conveniently located in a main floor corridor, operates a remote control contactor adjacent to the emergency lighting panel near the electrical service equipment.

A 70-ampere, 3-pole contactor is inserted in the main feeder to the 10-circuit fuse center panel protecting the



**CONTROL CONTACTOR**, mounted beneath emergency lighting fuse center, is operated by a push button located in a convenient place in a main corridor of this office building. Emergency lights are in corridors and stairs of the building.

## NEW LOW-PRICED *Permaflector* 200 WATT FLOODLIGHT!



PERMAFLECTOR  
ENCLOSED  
FLOODLIGHT  
ST-200  
FOR  
200-WATT  
INCANDESCENT

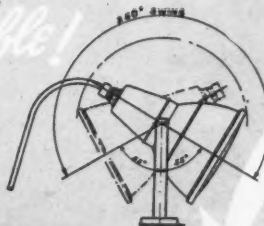
Powerful beam of light from a standard 200-watt lamp! Offers higher priced mechanical and performance features at low cost. Built to "take it", ST-200 is ideal for service on power shovels, bulldozers, trucks and cranes; completely adjustable

### SHOCK and WEATHER-PROOFED

Silver-mirrored glass PERMAFLECTOR; housed in corrosion-resistant sheet steel; convex, stippled, heat-resisting, 8" lens; porcelain socket; weather-proof cord grip fitting. 12 1/2" high overall; weighs only 6 1/2 lbs.

*Adjustable!*

250° swing vertically;  
360° horizontally, by  
adjusting wing nuts on  
bracket and base.



*Data!*

200-watt PS-30  
Incandescent Lamp  
Beam spread ..... 30°  
Overall spread ..... 145°  
Lumen output ..... 2545  
Beam candlepower ..... 7400

## PITTSBURGH REFLECTOR CO.

MANUFACTURERS OF LIGHTING  
EQUIPMENT AND THE FAMOUS

*Permaflectors*

OLIVER BLDG. PITTSBURGH, PENNA.

Please rush complete data on small-wattage PERMAFLECTOR  
Floodlight ST-200 - EC 4-43

NAME .....

ADDRESS .....

CITY ..... STATE .....



# War Communications DEPEND ON Proper COIL INSULATION



Irvington Varnished Cambric Tape insulates the coils of magnetos manufactured by Wico Electric Company — magnetos, used to help our Air Corps, Engineer Corps, and Signal Corps to carry on their important communications.

Because of its high tensile strength, elasticity and tackiness Irvington Varnished Cambric Tape can be wrapped around corners and still conform to surface contours. Its high dielectric strength, even after elongation, provides ample insulation. Further protection is secured through its excellent resistance to moisture, lubricating oil, acids and alkalis.

Available in lengths of 36 and 72 yards, in any width from 1/2" to 6" and in thickness from .005" to .012".

For complete coil insulation data — information on tapes, varnished paper, coil insulating varnishes — write Dept. 96.

*Lap winding magneto coils with 3/4" x .007" Irvington Black Bias Cut Varnished Cambric Tape. The fibre board needle has been wound with enough tape to cover the coil completely.*



*This device used by Wico speeds production and reduces waste by winding needles with the correct amount of tape required to insulate coils of the same type.*

## Irvington

VARNISH &



INSULATOR CO.

IRVINGTON, NEW JERSEY, U.S.A. • PLANTS AT IRVINGTON, N.J. and HAMILTON, ONT., CAN.  
Representatives in 20 Principal Cities

## Methods

[FROM PAGE 53]

emergency lighting branch circuits. Both the contactor and fuse center are flush mounted in steel cabinets.

## PROFITABLE SALVAGING

INDUSTRIAL

In many instances, vacuum cleaners, while being used to clean floors, walls, roof members, etc., can also act as a salvaging agent. This plant, in the eastern part of the country makes bronze and magnesium powders. The process is dusty, hence much of the



*RECLAIMING MATERIAL from an unlikely position — amongst the roof members of an eastern powder plant.*

fine particles soak the air and become attached to members of the building.

Instead of letting this scarce material go to waste it is profitably salvaged by an industrial type cleaner. Finely powdered bronze dropped on the sea, floats and will mark position of a submerged submarine. The operation returns a good profit.

## NEW PANELS IN OLD CABINETS

WIRING

Use as much of the existing equipment as possible, was the directive given Super Electric Construction Company, Chicago, when they recently rewired an old office building to house expanding government war agencies.

Their job was to change over the electrical system from the old d.c. type

*Electrical Contracting, April 1943*



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1943

To Make Wire and Cable Splices  
**LAST LONGER**

Use  
**PANTHER and DRAGON  
TAPES**

A splice must be made so as to restore the insulating value of the original covering. Only high grade rubber and friction tapes should be used. That's why you should use PANTHER and DRAGON Tapes.

- ① First to be wrapped and sealed in Cellophane
- ② Perfect adhesiveness and tensile strength
- ③ Strong durable core
- ④ Colorful attractive boxes
- ⑤ A Company in the insulation business since 1878

**HAZARD INSULATED WIRE WORKS**  
Division of THE OKONITE COMPANY  
WILKES-BARRE, PA. Offices in Principal Cities

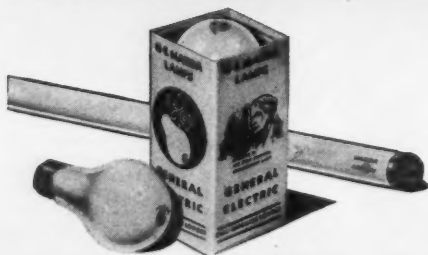
Sold only Through  
Recognized Independent  
Wholesalers

BUY U. S. WAR BONDS - Every Payday All Hazard Employees BUY U. S. WAR BONDS

Electrical Contracting, April 1943

3218

# Can you find the



## **G-E MAZDA LAMPS**

*Made to stay brighter longer*

# le Three Saboteurs ?



**Y**ES, there are actually three "saboteurs" in this picture. They are Glare, Shadows, and Dirt. Glare from half-shaded bulbs. Shadows on the work. And Dirt on walls, ceilings, and light fixtures.

You'll find them even in the new streamlined plane factories. But the plants they love best are the ones that never worked a night shift before. Plants where lighting was originally installed *only as an aid to daylight*.

*This is where lighting men come in!*

Already more than 3000 lighting men are pledged to help speed war production with better lighting. Representatives of electrical wholesalers and contractors, electric service companies, lighting equipment manufacturers. As Wartime Lighting Counselors, they are checking up on war plant lighting and suggesting simple changes to correct bottlenecks—changes that require a minimum use of critical materials. The results—in improved production, in reduced spoilage and accidents—have been amazing. But so far their efforts have barely scratched the surface. Right in your own territory many plants and shops are struggling to run a night shift in light that was never adequate even for daytime production!

It's a job that's really important to the war effort. And it calls for the cooperation of every lighting man in America!

What are you doing to help?



*General Electric is telling your customers this story in page ads in May issues of Modern Industry, Mill and Factory, Purchasing, Factory Management and Maintenance, Electrified Industry, Illumination, American Machinist, Iron Age, and other publications.*

# GENERAL ELECTRIC

# NO RESTRICTIONS ON

**Wire-Nuts**  
Solderless, Tapeless Wire Connectors



**Immediately  
Available!**

## SAVE CRITICAL MATERIALS

Government restrictions on the use of critical materials for electrical connections do not affect IDEAL "Wire-Nuts"—because these solderless—tapeless connectors do not require lead, tin and rubber. Thousands of contractors making millions of wire joints have already standardized on "Wire-Nuts".

### BETTER, Electrically; STRONGER, Mechanically!

IDEAL "Wire-Nuts" speed wiring, make BETTER wire joints—FASTER! The coil spring insert automatically compresses, twists and "threads" the wires and the "Wire-Nuts" together to make a joint several times stronger than soldered joints. FULLY APPROVED. Listed by Underwriters' Laboratories, Inc.

Sizes for Every Job, from small conduit fittings to sizes large enough to join 3 No. 10 wires. Ask your Electrical Jobber for Samples.

PROMPT SHIPMENT

**IDEAL**

IDEAL COMMUTATOR DRESSER CO.

1041 Park Ave.

Sycamore, Ill.

Sales Offices in All Principal Cities

**Wire-Nuts**  
Solderless, Tapeless Wire Connectors



Speed up Fluorescent Fixture Installations and Repairs with "Wire-Nuts". Pass inspection quickly.



Roughing-in is greatly simplified with "Wire-Nuts." No danger of fires or burned woodwork.

*Methods*

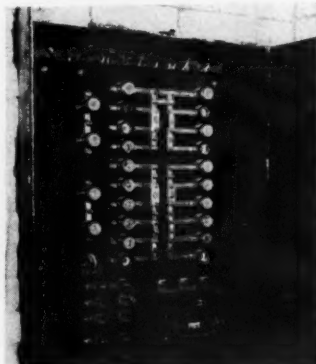
[FROM PAGE 54]

to a modern a.c. 3-phase, 4-wire distribution. Existing cables and conduits were reused wherever possible. The old d.c. distribution panels were removed and the new fuse panels built to fit the old cabinets.

The panel illustrated contains a 100-ampere, 250 volt, 3-pole, dead front main



**EXISTING CABINETS** after the old d.c. panels were removed. Cables at bottom are new feeders pulled into existing conduits. Wires at top were removed and additional circuits pulled in where needed.



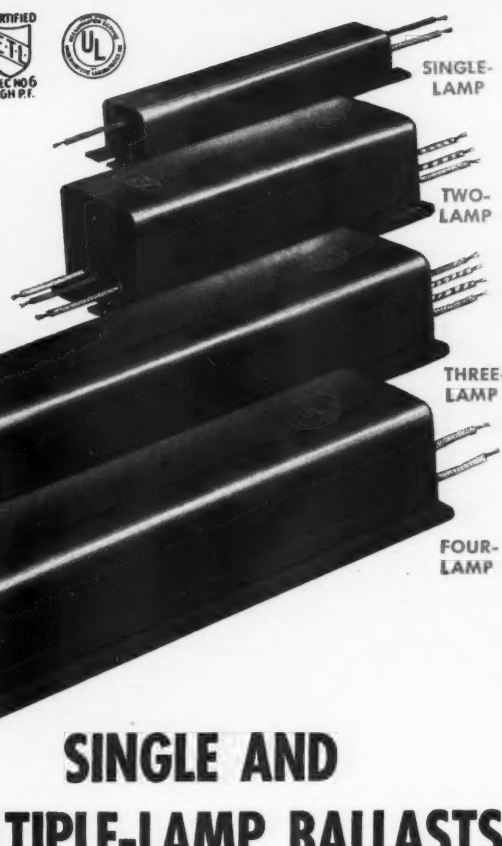
**NEW PANELS** were installed in the old cabinets. Surface type mountings were used for branch circuit fuses.

switch, mounted on the face of the panel as are the branch circuit fuses. The neutral bar is below the main switch. Fuse clips at the lower left are for future sub-metering.





CERTIFIED  
E.T.D.  
SPEC NO 6  
HIGH P.F.



## SINGLE AND MULTIPLE-LAMP BALLASTS

● Practically every fluorescent lamp installed today is providing illumination to assist in the production of badly needed planes, machines, tanks, engines,—combat equipment and war materiel of every kind. The satisfactory operation of these fluorescent lamps is essential, and this hinges to a great extent on the performance of one piece of equipment,—the Ballast.

At Jefferson Electric, the importance of the Ballast is well recognized,—and design, selection of all materials, construction and expert craftsmanship all contribute to the reliability for

which transformers and ballasts bearing the Jefferson Electric mark have long been known.

### *Save Critical Metals with Multi-Lamp Ballasts*

Where groups of fluorescent lamps are installed, great savings in copper and other metals are possible by using Multi-Lamp type Ballasts. Costs are cut and installation time reduced. Four 100-watt lamps, for example, served by one

Four-lamp Ballast saves 50 per cent of the cold rolled steel, silicon, and copper required for two two-lamp 100-watt Ballasts. Too, power losses are reduced, and since four-lamp Ballasts may be used on 250-280 volt circuits, conductors can be smaller than for 110-130 volt circuits, another saving of copper.

Write for Bulletin 421-FL which carries full data. Recommendations of our engineers are yours for the asking . . . JEFFERSON ELECTRIC COMPANY, Bellwood, (Suburb of Chicago) Illinois. Canadian Factory: 60-64 Osler Avenue, West Toronto, Ontario.



## FLUORESCENT LAMP BALLASTS

*Electrical Contracting, April 1943*

## How the Right Kind of Lighting Helps Improve Production

### Laboratory Findings: ①

#### LIGHT ACTS AS MAGNIFIER

Ability to see small details increases as illumination is increased. Light is a magnifier of small detail. (page 14)

#### ELIMINATION OF GLARE

When a glare source was located within 5 degrees of the line of vision, 84% of the light on the test object was wasted due to the presence of the glare source. (page 15)

#### FASTER SEEING

It takes time to see. Tests show that as illumination is increased from 1 to 100 footcandles, speed of seeing is practically doubled. (page 16)

#### GREATER EASE OF SEEING

Better illumination aids the individual in performing visual tasks. In one series of comprehensive tests, those with better eyes were aided 14% by better lighting while those with most deficient eyes were aided 22%. (page 17)

### Industry Experience: ①

#### IMPROVED ACCURACY OF WORKMANSHIP

A manufacturer of heavy aircraft parts reports inspection more efficient and production increased when lighting was improved (to 40-50 footcandles). Tool marks were easily seen and file marks revealed under the new lighting. (Case No. 79)

#### LESS SPOILAGE

A roller bearing manufacturer states that since lighting was improved (level raised from 15 to 45 footcandles), grinder operators spot improper grinder performance more quickly and can correct this before the work is spoiled. (Case No. 8)

#### INCREASED PRODUCTION

A valve manufacturer finds his men can read verniers more quickly with better lighting. Resultant over-all increase in production was 25%. (Case No. 30)

#### LESS FATIGUE

A manufacturer of intricate aluminum castings reports that his workers were less tired at the end of the day with new lighting (35 to over 60 footcandles), with higher values at final inspection benches. (Case No. 20)

① Data Source: "Value of Good Lighting in War Production," a report issued by the Illuminating Engineering Society.

## Helping Your Personnel to IMPROVE PRODUCTION is an Important Part of OUR WAR TASK



① See Benjamin booklet: "Benjamin Specifications for Productive Lighting in War Plants." Also American Recommended Practice of Industrial Lighting, approved by the American Standards Association.

Securing the improved production and all the other benefits of good lighting depends upon your making certain that the right kind of lighting is being provided for every operation in your plant.

#### What is the "Right Kind of Lighting"?

The basis of all good lighting is enough light—25 to 50 foot candles or more—depending upon the seeing task performed by your employees. In addition, such lighting must be properly directed and diffused as well as uniformly distributed over the working area.

However, most of the benefits from such good lighting are lost unless provisions are made to reduce direct and reflected glare to the minimum by the use of properly designed and installed lighting equipment.



Such lighting equipment also must be designed to provide maximum assurance against lighting failure, provide maximum light output consistent with proper shielding and operate at a minimum of maintenance trouble and expense. ①

#### Free Lighting Guide

In the Benjamin booklet: "Specifications for Productive Lighting in War Plants," is contained complete, concise information on how to obtain the right kind of lighting in your plant. Also data relative to the importance of reflector design and rigid Benjamin standards for mechanical strength which Benjamin, through 40 years of experience, has found to be essential for industrial lighting. A copy of this guide will be sent to you without cost or obligation. Simply write the Product Information Department H. Benjamin Electric Mfg. Co., Des Plaines, Illinois.

# BENJAMIN

TRADE MARK

## Lighting Equipment

# Industrial Electrification

## MAXIMUM USE

GETTING the most out of what we have in power and apparatus is a real challenge to every one of us. Some economies are dictated by government orders such as the new ratings for motor applications, others are dictated by long delivery schedules and empty stock shelves. But whether forced by order or circumstance, or through voluntary cooperation with the realities of all-out war conditions, checks on wasted power and equipment, the frugal use of new materials and the stretching of available resources takes skillful planning and ingenuity.

Inspection and analysis of existing wiring and apparatus is fundamental to a conservation plan. It can be carried out as a part of the regular maintenance routine. Then by rearrangement of apparatus re-circuiting, closer control over protective devices and eternal vigilance a conservation plan can be effected.

The accompanying article and guide sheet sets forth most of the points to check. There will be many others of perhaps equal importance in each plant.

Previous articles covered—  
Eliminating Causes of Severe Service Conditions

Providing Adequate Capacity for Increased Demand

Electrifying Operations to Reduce Unit Costs

Safety Protection for Electrical Operations

Increasing Flexibility of Electrical Service

Electrical Aids to Automatic Control

Electrical Ways to Reduce Waste How to Save Power

Protection Against Sabotage

Improving Working Conditions

Electrifying for Continuous Operation

Electrified Plant Housekeeping

Electrical Problems Under 168 Hour Schedules

Electrical Aids to Plant Conversion

Electrical Aids to Quality Control

Electrical Aids for Green Help

Codes in Wartime

Grounding for Safety

Air Raid Restoration

Operating Replacements

Preparing for Blackouts

Wiring for Quick Changes

Future articles will discuss—  
Welding in Industry  
Salvaging Electrical Equipment

ENGINEERING · INSTALLATION · MAINTENANCE

## STRETCHING AVAILABLE POWER

DEMAND for ever-increasing production is forcing more and more load on existing electrical systems. With little reinforcement material available, ways must be found to carry the added load on wire and equipment already installed.

Wasteful power uses must be found and eliminated; short-cuts must be found in manufacturing processes; inefficient power applications must be corrected; bad electrical conditions must be cleared up; grounds and short-circuits removed; circuits rearranged to utilize full current carrying capacity; power-factor corrected; loads scheduled to reduce short term peaks; and thinking revised to make possible continuous use of smaller quantities of power.

Available power for the purposes of this article may be defined as the maximum energy which can be utilized through existing wires, and the maximum which can be furnished through existing facilities by your supplier. To put more power through present wires and facilities means removing electrical bottlenecks and eliminating power waste in production.

The equipment items which limit power delivery are switches, transformers, and the distribution wiring of the plant. Each of these, when in good condition, has been designed and approved to carry certain maximum loads. Be sure that local troubles do not prevent use of the full rated capacity. Thermal devices such as fuses and overload relays will have their current carrying capacity seriously lowered through local heating caused by bad contacts, loose connections, loose lugs, pitted switch blades, worn switch-hinges, or high

room temperatures. Check for, and correct, any of these troubles first.

The extent and character of load on each circuit should be determined, and the amount of unused capacity in each established. This can best be secured by using recording ammeters which provide pictures of load conditions for more detailed study.

Because voltage at the point of use will drop as the ampere load on the circuit is increased, it is desirable to know the permissible voltage drop in each circuit. Load may be added so long as the voltage does not drop below that necessary for proper operation of connected equipment. Voltage conditions on circuits now fed from the end



**PROPER LUBRICATION** of motors and production equipment is a must in order to reduce friction, heating and other contributing losses. The screw-cutting machine is used in making armor-piercing bullet cores. OWI photo.



may be improved if they can be reconnected to be supplied from a point near the center of the load, thereby reducing load on part of the circuit.

### Higher Voltages

The energy carrying capacity of long feeder-circuits can be multiplied by raising the operating voltage. It is often quite simple to install step-up transformers after the control switch and step-down transformers ahead of the distribution panel and thus correct feeder overloads without changing the switches or the wire. This is particularly helpful in cases of long circuits having excessive voltage drop due to length of runs.

Raising the plant operating voltage might also be possible and desirable. This is a matter which should be considered in cases of plant expansion, for it is then possible to purchase all added equipment for the higher voltage. The older load can be powered through step-down transformers. Power loss through the transformers will be smaller than line loss at the lower voltage.

### Rearrange Circuits

Depending upon wiring conditions in the plant, it may be possible to tie two circuits together for parallel operation, thereby taking advantage of the diversity of the loads formerly fed by the two circuits separately. Where two similar sized circuits feed closely associated panels, it may be feasible to create a loop supply for the two panels by installing short sections of wire or by utilizing sub-feeders as tie lines. Each of these methods adds to spare capacity by taking advantage of the

diversity of load on individual circuits.

Circuit wire sizes are usually specified to carry the starting current of the largest motor plus the full running current of all other motors. Since few motors are fully loaded or running continuously at normal load, this design condition permits adding other units to use the spare capacity thus created.

### Control Loads

Manual load scheduling has limits of usefulness, for many relatively short loads are not easily susceptible to visual timing. Electrical timing, however, can be inserted to delay the operation of one unit long enough to prevent simultaneous peaks. One firm has put electrical timers on a group of air-compressors operating as a unit from one pressure control. This unit delays the start of successive motors until the preceding one has reached running speed. Air supply is not noticeably affected, and no simultaneous peaks occur.

In this same plant, spot welders are controlled by timing units which prevent two welders from striking together. Because the delay is a matter of cycles only, the operator generally does not know that his weld had been delayed. In much the same manner, it might be possible to control the variable units of two electric ovens so that these portions of the heating load do not come on together. In each plant, conditions likely exist whereby control of short-term loads can prevent simultaneous peaks which otherwise would cause severe voltage dips.

A review of the starting characteristics of frequently started motors is worthy of consideration. If starting-current is causing severe voltage dips,

it may be possible to use a lower tap on the compensator, or to replace the motor with another having lower starting current. Large motors starting without load may be brought up to speed by a small motor before power is applied to the large one. This procedure is effective in limiting severe overloads when starting large motors.

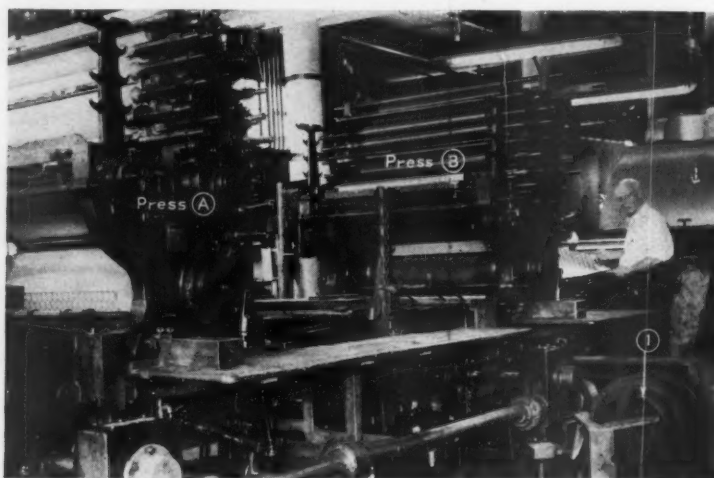
Rigid control over fuse replacement is one way of preventing motor burn-out and overloads caused by troubles on the driven machines. One firm keeps a spare set of correctly-sized fuses in the fuse box. No others may be used until the reason for the blown fuse has been established. In another plant, each fuse size is painted a distinguishing color for each ampere rating. None but a fuse of the same color may be used as a replacement. If the second fuse blows, the unit is taken out of service until the trouble has been located. In each of these plants, practically no motors have burned-out from overload. Time, expense, material and power have all been saved by these rigid controls of fuse replacements.

A program of salvaging wire will provide much new current carrying capacity. In almost every plant, there are circuits which no longer serve the purpose for which they were installed, but have not been removed. Checking all circuits will reveal much unused wire. Also, many lightly loaded circuits can be released for salvage by transferring the load to other circuits not operating at capacity. In many instances, creation of new sub-distribution points to shorten motor circuits may make much wire available for other uses.

### Higher Power Factor

Power-factor improvement is recommended as an almost universal way to release current carrying capacity in the entire wiring system. Since the ampere load on the system is in inverse ratio to the power-factor stated in percentage, current carrying capacity will be released in the same ratio as power-factor is improved. Power-factor correction devices to release this capacity ordinarily require less copper and critical materials than would an equal line reinforcement, and hence approval for their purchase is much more likely to be granted. Power-factor correction has the further advantage of releasing capacity in the power company's distribution system and generators, which is a factor likely to have a bearing on securing purchase approval.

New restrictions on the purchase of motors will compel a study of motor applications in the plant to make more capacity available without additional purchases. Reapplying motors to carry



*A 15 HP. MOTOR, with V-belt, drives both lithographing presses in complete synchronization. Together they give three times the output of a single press and in turn each kw. used turns out 50 percent more goods.*



# MAINTENANCE GUIDE SHEET

## Check Sheet

### A Questionnaire to be Filed with Management

#### MORE POWER THROUGH PRESENT WIRES

##### LOCAL TROUBLES

- Are contacts carefully maintained?
- Are connections tight?
- Are switch-hinges in good condition?
- Have fuse and switch clips been overheated?
- Are fuses too small?
- Is equipment in a dry place?

##### MOTOR TROUBLES

- Do motor fuses blow frequently?
- Is condition of motor and load checked after fuses blow?
- Do bearings fail from high belt tension?
- What motors have burned out from overload?
- What corrective measures have been taken?
- Is voltage correct or too low?
- Does motor start load easily?
- Does motor start under load?
- Is motor normally fully loaded?
- Is room temperature high or normal?

##### CIRCUIT REARRANGEMENT

- What is load on each feeder circuit?
- What circuits have parallel runs?
- Can circuits be paralleled electrically?
- Can one circuit be released by transferring load to other circuits?
- What is character of load on each circuit?
- Can loop circuit be set-up?
- Can the feed point on circuit be relocated to center of load?

##### LOAD CONTROL

- What diversity exists between loads on different circuits?
- Can manual control be used to prevent simultaneous peaks?
- Where can electrical timers be used?
- Can time-delay units be installed?
- Is a different motor with better characteristics available?
- Can sudden peaks or sudden load increases be controlled?

##### OPERATING VOLTAGES

- What is present voltage drop?
- Is voltage at unit satisfactory?
- Can feeder voltage be raised?
- Can service voltage be raised?
- Can plant utilization voltage be raised?
- Are there excessive voltage dips?
- What units cause voltage dips?

##### POWER-FACTOR CORRECTION

- What is overall power-factor?
- What is power-factor of individual circuits?
- What motors are underloaded?
- What motors can be changed easily?
- Can group drive motors be more fully loaded by adding production units?
- How much power-factor correction is needed?
- What correction is needed on each circuit?
- Where should capacitors be installed?
- Can large motors be replaced with synchronous units?
- Are present synchronous motors operating at maximum leading power-factor?

#### MORE POWER BY REDUCING INDUSTRIAL WASTE

##### BEARINGS

- Are all bearings needed?
- Can shafting be removed?
- Is bearing pressure at minimum?
- Is shafting properly aligned?
- Are belts too tight?
- What vertical drives can be removed?
- Are bearings close to load?
- How many idlers are in use?
- Where may pivoted motor bases be used to shorten drives and replace idlers?
- Are there angle drives using guides?
- Have bearings been checked for correct size?
- How many bearings "burned-out" during the past month?
- Why did these burn-out?
- What corrective measures have been taken?
- What redesign of shafting system would you suggest?

##### LUBRICATION

- Has expert advice been received on correct lubricant for each job?
- What is frequency of oil inspection?
- Are bearings cleaned regularly?
- Are anti-friction bearings flushed?
- What precautions are taken against too much lubrication?

##### POWER WASTERS

- When was air system last checked?
- What control is exercised over use of compressed air?
- Is air pressure higher than needed?
- Are water valves checked for leaks?
- Can water system be checked for leaks?
- What assurance is there of no unknown leaks?
- Is flow of cooling water kept at minimum?
- Are unneeded flushing streams flowing?
- Are refrigeration units in good order?
- Can colder cooling water be provided?
- Are heat-locks in use?
- Are ventilating system outlets ample?
- Are there constrictions and needless bends in the duct-work?
- Are exhaust systems "free-flowing"?
- Is high-pressure water used where low pressure would suffice?
- Are high-pressure centrifugal pumps running without delivery?

##### MANUFACTURING METHODS

- How much idle running time on production units?
- Will automatic feed reduce idle running time?
- Will automatic take-off increase production?
- Can production units be synchronized to prevent waits for material?
- What operations can be consolidated?
- Can machines be relocated to reduce material travel?
- What is present percentage of rejects?
- What are causes of rejects?
- How can number of rejects be reduced?

##### OVERALL WASTE OF POWER

- What is your estimate of percentage of total power wasted in this plant?
- What, in your opinion, is reason for this waste?
- What can be done about it?

approximately full load during the maximum of running time is also about the best way to improve power-factor, for underloaded motors is the major cause of low power-factor. If motors of the correct size are used, the power-factor during periods of loaded running will generally be above 80 percent. However, diversity again enters the picture for few motors run uniformly loaded. Additional correction equipment is likely to be needed to off-set low power-factor during periods of low load. Where large synchronous motors can be used, load may be carried with a leading power-factor to offset the lag of the underloaded induction motors. If few large motor units are needed, capacitors, located at the motor or the distribution point furthest from the point of supply, will provide the needed correction at low cost.

#### Check on Wasted Power

Of equal or greater importance in the supply of useful energy is the elimination of industrial waste of power.

Estimates of the amount of power wasted in industry run all the way from 10 to 60 percent of the total consumed. No one knows the correct figure, but it is doubtful whether the best plant wastes less than 10 percent of the amount paid for; or whether the worst plant uses productively as much as 40 percent of its total. The condition is somewhat similar to a boiler crew fighting for a one percent improvement in boiler efficiency while some careless workman permits 10 percent of the steam to go to the sewer. We must stop this waste.

First should come an inspection and analysis of the number, type and condition of bearings in use, for much of the wasted power is lost in friction.

#### Study Bearings

In most older plants it is possible to reduce greatly the number of operating bearings. Each unnecessary bearing adds its load of friction and troubles of bearing maintenance. For example, almost any extensive shafting system will include many jack-shafts and cross-overs. There are also likely to be many long-center drives, and others using idlers and pulleys for guides. Much power can be saved by redesigning the system, for many of the jack-shafts, cross-overs, long-center drives and idlers will be found unnecessary. Single-shaft groups, short-coupled drives, and direct drives remove many of the most prolific wasters of power.

Bearing location is important, particularly on shafting. If the bearing is not located close to the loaded pulley, the

shaft will become distorted and tend to bind in the bearing. Self-aligning bearings do not correct for this, as belt pressure will cause the shaft to bend at the bearing. Regardless of the application, keep the bearing as close as possible to the point of stress.

Excessive bearing pressure causes breakdown of the oil film with its resultant increase in friction and bearing failure. This may come from misaligned shafting or running the belts too tight. Badly aligned shafting is found most frequently in older buildings but may also be present in new installations. It should be quite easy to turn the shaft by hand if properly lined-up. Tight belts are most common where the belt is too light or where the drive is ver-



**DEMAND LIMITER** saves valuable power. When needle of demand meter (A) swings to a predetermined kw. peak, a phototube (B) operates relays to cut off power demand.

tical. Increasing belt tension to overcome the faults of a badly designed installation puts extra burdens on the bearings. This means added friction loss and more bearing failures. Correction of the drive design will reduce maintenance and save power.

#### Other Power Wasters

Many services used carelessly about the plant consume large amounts of energy. These include compressed-air, high and low pressure water, refrigeration, ventilating and exhaust systems, and sewage. If the waste through carelessness and poor maintenance could be eliminated, the power used for these purposes could be materially reduced.

Leaks in the piping system and careless operation of the nozzles will waste much of the air put out by a compressor. Leaky valves and flowing streams of

cooling water may take a large percentage of the water pumped. Quantities of cooling water may be reduced if the maximum permissible temperature rise is used to govern the gallons passed through the cooling unit. Power to high-pressure centrifugal pumps can be minimized if the control stops the pump promptly when the pressure goes beyond the cut-off point of the pump.

The amount of refrigeration supplied can be reduced by careful maintenance of the insulation on cold rooms and boxes, and if heat-lock entrances are used in cases where traffic in and out of the room is heavy. Wasted power for air movement can be reduced if excess air changes are reduced and if outlets are unrestricted and of ample size. An oversupply of process water running to the sewage system loads its pumps unnecessarily.

#### Manufacturing Shortcuts

Improvement in manufacturing methods provides more power capacity through increased production efficiency. Shortcuts which reduce the number of operations or which finish more pieces at one setting are direct means of saving power. Examples are multi-spindle drills which bore many holes at one setting, or drilling many plates from one template setting instead of one plate at a time.

New methods apparently using more power may, in fact, use less power per unit of production. Arc-welding, replacing riveting, seems to require more power, but so speeds production and cuts down the amount of compressed air needed that actual power used is likely to be less.

For a given production, automatic feed and take-off may effect large power savings. This is because automatic feed tends to keep a machine producing regularly. As the power consumption on many machines varies only slightly between idling and production, wasted power is saved in proportion to the decreased idling time. Coupling sequential machines to run in synchronism also tends to reduce idling time. Similarly, conveyors require only slightly more power running loaded than running idle.

Higher operating efficiency through better plant layout will save some power on each unit of production. If the distance material travels is shortened by shifting a machine location, the amount of aisle space needed for trucking and the floor area for storage will be cut down. Such corrections will increase production per square foot of floor space, and power for such items as light, heat, ventilation, cleaning, and trucking will be reduced proportionately.



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Now available from 2 to 15 horsepower.



15 horsepower, splash proof, squirrel cage, induction motor. For installations requiring protection from falling objects or plant wash-downs.



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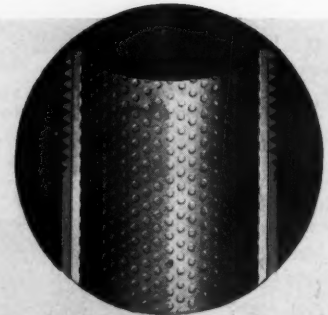
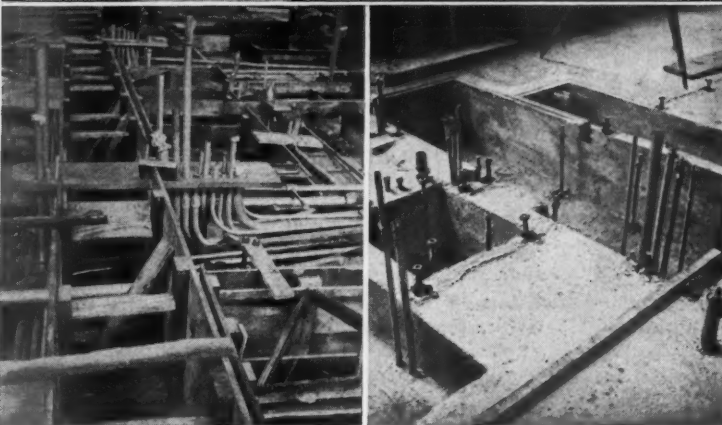
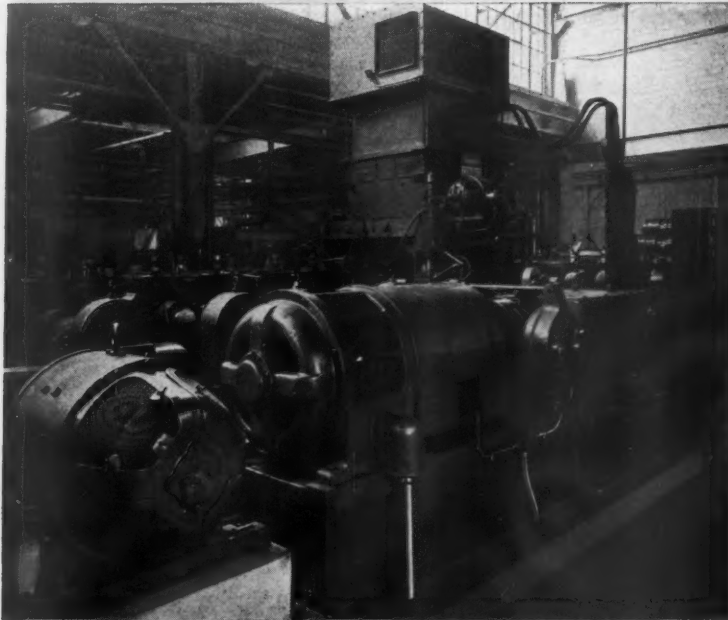
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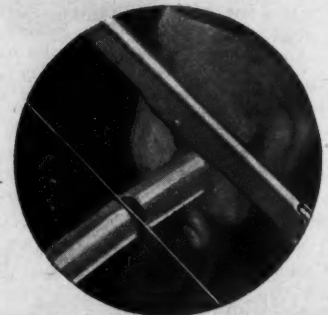
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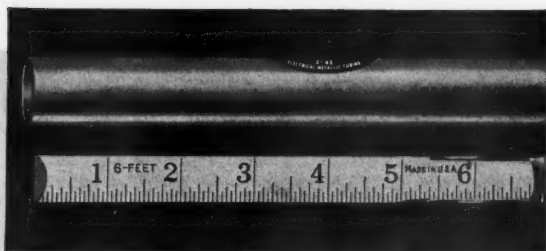
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*Steel and Tubes Division*

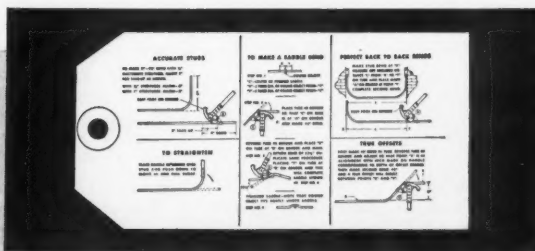
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*Electrical Contracting, April 1943*

67

# Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay \$5.00.

## METAL LIGHTING FIXTURES

**QUESTION 90.** *During a lightning storm, what would cause blue flashes and a snapping sound from metal light fixtures and main service switch? The ground is an eight foot copper rod and looks good. We have several homes in the country with this trouble.—W.L.C.*

**A.** TO QUESTION 90. The blue flashes and snapping sound from metal light fixtures during lightning storms are evidence of relatively high voltages appearing from the distribution circuit to ground, as well as between the different conductors of the house wiring, indicating short breakdowns.

Unfortunately, a ground cannot be judged by its appearance. An 8-foot copper rod may have a resistance of only a few ohms or it may have a resistance of several thousands of ohms. The resistance value depends on the type of soil in which the rod is embedded, as well as on the condition of the soil, whether it is wet or dry at the time. If a lightning stroke discharges through the ground rod, the voltage of all parts of the system connected to that rod will rise to a maximum given by the product of current crest multiplied by the resistance of the rod. For instance, if the lightning stroke current is 10,000 and the resistance is 10 ohms, a voltage of 100,000 volts would appear on all grounded parts of the secondary distribution system in the house. If the resistance or the current should be ten times as large, the voltage also would be ten times as large. In addition to these voltages to ground, there may be differences in voltage between the phases of the wiring due to inductive drops in

the system. This phase is not very easily explained in the layman's language. However, the voltage required to arc over switches or outlets is relatively small, of the order of a few thousand volts.

There are several means of avoiding occurrence of this phenomenon: first, to reduce the voltage of the ground system, a more elaborate grounding system employing several rods distributed over a considerably wide area can be installed; second, to avoid snapping over different phases of the wiring, a low voltage arrester can be installed at the house entrance or at the distribution transformer supplying the house its power; and third, the position of the high voltage distribution arrester may also have a bearing on the voltages that might enter the secondary circuit, and in this way get into the house. Therefore, a check-up of the nearest high voltage lightning arrester position might be indicated.—J.H.H.

**A.** TO QUESTION 90. The flashes and snapping sounds noticed in the metal light fixtures and the main service switch probably result from induced voltages set up between the different conductors and the ground. Even though a proper connection is made to a standard ground rod, it is possible for the induced voltage to build up.

Sometimes the ground conductor is not direct and the resistance may be high. Whenever the path to ground is shorter across a small gap, a breakdown is apt to occur. Bonding noncurrent-carrying metal parts together and making sure that the grounding conductor is continuous, by as short and direct a route as possible will help limit such breakdowns.—J.E.W.

**A.** TO QUESTION 90. The trouble described in this question is

apparently due to improper grounding. The grounding rod may look as though it is good but still be of a high resistance. If equipment is available to test this ground, it should be tested and the maximum value should not be over 25 ohms. By driving additional ground rods at least four feet apart and connecting these grounds in multiple, the ohmic resistance can be lowered. If the neutral is not tied into the ground rod at the service entrance, this should be done provided the neutral is grounded at the transformer. Also, the resistance can be lowered by tying this ground rod in with the water system if the water system is fed from a driven well or a spring which is considerable distance from the house. In making the last statement, I am assuming there is no city water system due to driven grounds being used. However, if there is a city water system, this should be done first of all.

This location described may be one that has a high vulnerability to lightning discharges. Another remedy, aside from the electrical protection, would be the use of lightning rods on the house.—C.J.R.

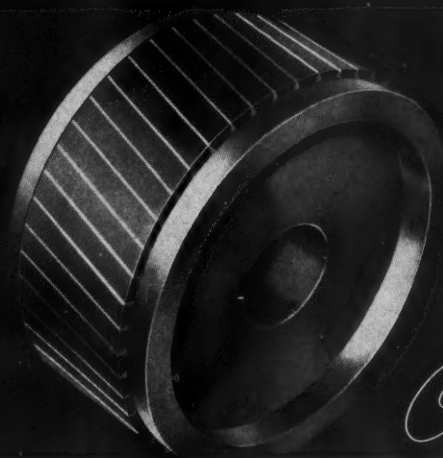
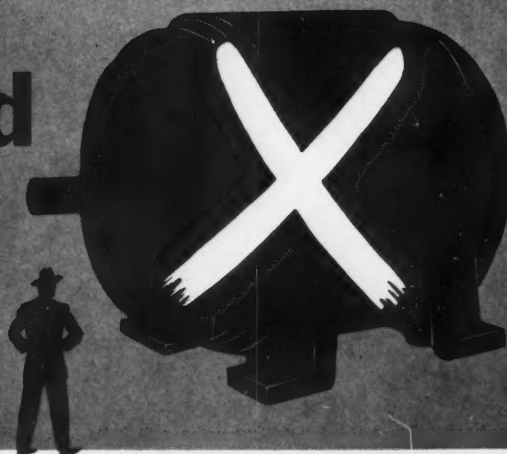
## LEAD COVERED CABLE

**QUESTION 91.** *A lead sheathed cable, containing three No. 6 wires has been installed on the ceiling of the basement, and is used to supply power to an ice machine on the first floor. This cable has been installed 12 years. Last week there was a loud report, and upon investigating, the cable had exploded, ripping two sizable holes in lead and insulation, about 6 to 10 inches apart. Can you explain this explosion?—J.M.F.*

**A.** TO QUESTION 91. Assuming there were no short circuits or ground between the current-carrying conductors and the sheath (probably grounded) this explosion apparently was caused from an accumulation of moisture inside the sheath. This moisture accumulation does not necessarily have to be at the explosion points, but somewhere in close proximity. The explosion points probably were points in the sheath that were slightly weaker than other places.—C.J.R.

**A.** TO QUESTION 91. It is my opinion that the lead sheathed cable mentioned had a small break, or hole in the lead sheath. Over a period of time, the ammonia fumes from the ice machine on the floor above seeped

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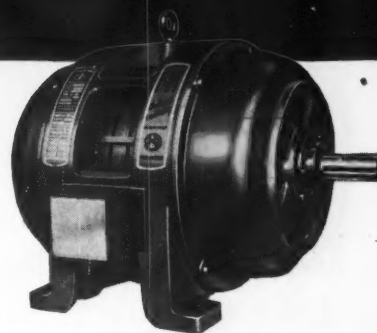
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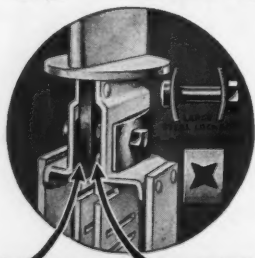


# Motors





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## Reader's QUIZ

[FROM PAGE 68]

into this opening. This caused an oxidation of lead, copper and oxygen which in time formed a highly explosive gas. This gas built up such a pressure that it had to find a way out, with the resulting damage to the lead sheath.—J.H.

**A.** TO QUESTION 91. There may be several factors contributing to the fault. The predominating causes, based upon the description of the location and the probable atmosphere suggest condensation, electrolytic action and vibration. Condensation is the result of a certain percentage of humidity in the atmosphere surrounding this part of the electrical equipment which is subject to a wide variation in temperature between the internal structure and the radiating surface. It is suitable for electrolysis. In addition, electrolytic action resulting from improper bonding and the consequent stray currents must be considered. Vibration, however small, may account for developed faults if the cable is subject to tension stresses due to method of support.—O.A.

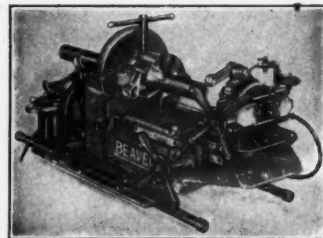
**A.** TO QUESTION 91 The lead sheathed cable contained insulating oil, which, like other oils, is explosive. A short circuit in the cable exploded the oil and ripped the holes in the insulation and lead. The reason for two holes being ripped was that there were two weak spots in the lead very near to the point of short circuit.—O.S.H.

## BUSBAR CLAMPS

**Q**UESTION 92. In ordering busbar clamps why is it necessary to specify whether they are to be used on a.c. or d.c. and what would be the result if the wrong type were used?—J.J.L.

**A.** TO QUESTION 92. It is necessary to specify whether the busbar clamps are to be used on a.c. or d.c. because if you used a galvanized malleable iron clamp on a.c. which is to be used for d.c. only, you would cause the busbars and clamps to become very warm. The clamps for a.c. must be bronze for outdoor use, which is non-magnetic, and half bronze and half galvanized malleable iron for indoor use. The half bronze and half galvanized malleable iron breaks up the magnetic field, therefore, no heat.—L.R.T.

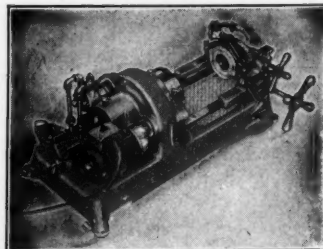
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A high-speed heavy-duty deluxe Pipe and Bolt Machine. Range  $\frac{1}{4}$  to 2-inch-up to 12-inch with geared tools and drive shaft. Bolts,  $\frac{1}{4}$  to 2-inch. Wt. 415 lbs.

Write for Bulletin A



### Beaver Model-B

A light-weight utility Pipe and Bolt Machine combining many features of Model-A with the easy portability of Model-C. Range  $\frac{1}{8}$  to 2-inch up to 8-inch with drive shaft and geared tools. Bolts up to  $1\frac{1}{2}$ -inch. Weight 280 lbs.

Write for Bulletin B



### Beaver Model-C

A STURDY LITTLE POWER UNIT Converts hand pipe tools into power tools from  $\frac{1}{4}$  to 8-inch. Threads 8-inch in 6 minutes. Threads bolts up to  $1\frac{1}{2}$ -inch. Two men can work at the same time without interference. Weight 150 lbs.

Write for Bulletin C

Write for new Tool and Machine Catalogue—Just off the press

**BEAVER  
PIPE TOOLS**

442 Deen Ave., Warren, O.



**A.** TO QUESTION 92. Current in a bus induces a magnetic field encircling the bus. Alternating current produces an alternating magnetic field, the strength of which depends on the reluctance of the space immediately about the bus. Thus, if a steel or iron clamp with steel bolts were used on an a.c. bus, a dense alternating magnetic field would be set up in the clamp and produce hysteresis losses in the clamp material with consequent heating. A.C. bus clamps are therefore constructed of only one side ferrous material, the other half being non-ferrous to break the heavy magnetic field which would be set up in a closed ferrous circuit; they are also obtainable of entirely non-ferrous material.

Direct current sets up a uni-directional magnetic field which varies only on change in current and always at the same polarity. Hysteresis losses in an iron or steel clamp are very slight.

Since iron clamps are less costly than non-ferrous type, they are generally used for d.c. However the non-ferrous (a.c.) type could be used just as well.—E.S.

**A.** TO QUESTION 92. Busbar clamps are cast from copper, brass, bronze, aluminum and iron. For d.c. service it does not make any difference which are used. In a.c. service if iron clamps were used, in effect the busbar would be surrounded by an iron loop which is of magnetic material. The resultant magnetism set up in the clamp would tend to increase the reactance of the busbar with a corresponding increase in the voltage drop. The hysteresis and eddy currents in the clamp would also cause heating of the clamp and busbar. Oftentimes one half of the clamp is of iron while the other half is of one of the other metals so the busbar will not be surrounded by an iron loop. This reduces the total cost of the clamp also.

For heavy service the bolts should be of a material that has very nearly the same coefficient of expansion as the busbar. Everdur or other high-copper-silicon alloys, and Monel metal are some of the materials generally used for this purpose.—L.H.

**A.** TO QUESTION 92. Busbar clamps used where large a.c. currents are present should not be of magnetic material throughout. If such material (steel or malleable iron) is used, the magnetic field will be increased and the resultant hysteresis loss will cause serious heating. The general practice is to use the one part of the clamp of malleable iron and the other of bronze (nonmagnetic). This type could also be used satisfactorily with direct current, but clamps made of all malle-



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## Reader's QUIZ

[FROM PAGE 71]

able iron will also be satisfactory and will probably be cheaper.—J.E.W.

**A.** TO QUESTION 92. Busbar clamps for direct current may be made of iron because there is no induction present, whereas with alternating current induction is present and at least one of the clamps should be made of non-magnetic material so as not to have a magnetic circuit around the individual busbars. If they were made of magnetic materials for a.c. high current busbars, the induced currents in the clamps would cause them to heat.—J.H.P.

### Can You ANSWER these QUESTIONS?

**QUESTION W3**—The power factor meter dial is made with an upper set of leading and lagging figures and also a lower set like a complete set of false teeth. If the pointer should swing down into the lower set of figures, would it make any difference?—R.G.S.

**QUESTION X3**—I have had many complaints from housewives of receiving a slight shock at kitchen sinks and lavatories when placing one hand in the water and touching the faucets with the other. Investigation with a 1000 ohm per volt meter indicated potentials as high as 42 volts and 15 mil amperes between water in bowl and faucets, which can readily be noticed with wet hands. The solution is to bond the water piping to the basin drain pipe, which is normally pretty well insulated from the faucets by the rubber gaskets between the jam nuts and the porcelain bowl and are often only electrically connected by the earth where the drain soil pipe and water service are buried. Disconnecting the electrical service to the premises has no effect on the indicated voltage at the sinks.

This condition prevails in a rural village supplied by a 3 phase, 3 wire high line with substation in the edge of town and conventional distribution system with 230—115 volt grounded neutral and some 230 volt ungrounded 3 phase secondaries. Although the village has a water system the utility company has always insisted on a driven ground at all services and will not accept N.E.C. methods of grounding to water system.

The question has come up as to whether driven grounds instead of water pipe grounds is the reason for the condition outlined above.—E.L.R.

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- Removes film with no dusting
- Keeps motors and generators fit—to last longer
- Hones commutator or ring to a mirror face
- Restores commutation to normal
- Reduces sparking and brush wear
- Styles for all sizes of commutators and rings
- Sold under absolute guarantee of satisfaction
- Send for folder giving complete details

Manufactured by Ohio Carbon Co.

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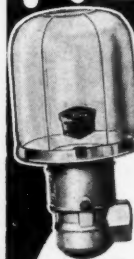
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In Canada: IRVING SMITH LIMITED, Montreal

ANNOUNCING--AFTER 30 MONTHS OF DEVELOPMENT--

the only complete line of motors in which all types in any one frame size are interchangeable and similar in appearance!

# ROBBINS & MYERS Uni-Shell MOTORS

Here's one of the biggest improvements in electric motors in years! Greater interchangeability of *all motor types* than has ever been known before!

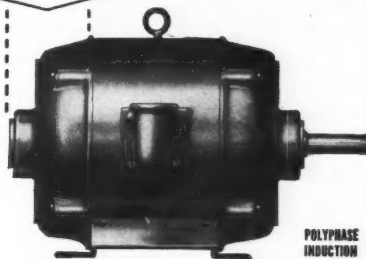
Within cylindrical shells of steel we are building not only the finest line of motors we've produced in nearly 50 years, but motors that—for any one frame size—have *identical* shell dimensions, head fit, bolt circle holes, base, shaft size, and conduit box mountings. Where one type of Uni-Shell Motor can be mounted, so can any!

In development for 30 months, and thoroughly tested and proved in hundreds of grueling war-production applications, R & M Uni-Shell Motors embody many other improvements, too, that contribute to longer life, greater dependability, and higher efficiency. New insulating techniques, combined with the finest materials obtainable, keep interior temperatures *below* guaranteed minimums. Better bearings and better balancing assure unusually smooth, trouble-free operation. And we have utilized our broad fan-building experience to make interior ventilation better than ever.

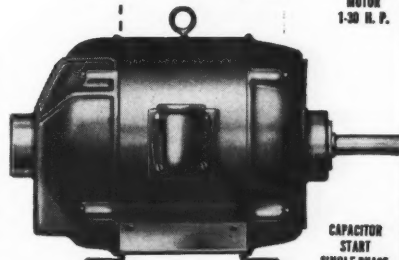
Whether you use motors as part of your product, or only on the machines in your plant, the advantage of *interchangeable motor types* is obvious. The other advantages offered by Uni-Shell Motors will be obvious, too, when you know the whole story. Read the back of this page and then mail the coupon for your copy of our 20-page, fully illustrated booklet!

Only end heads change

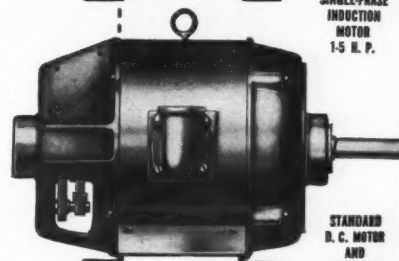
Every dimension and detail, from Uni-Shell motor-body to head fit, is identical for all motor types!



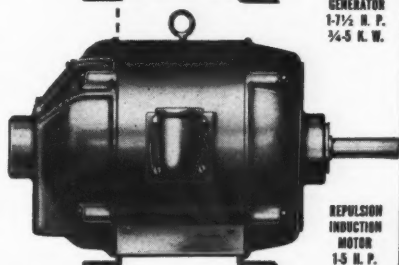
POLYPHASE  
INDUCTION  
MOTOR  
1-30 H. P.



CAPACITOR  
START  
SINGLE-PHASE  
INDUCTION  
MOTOR  
1-5 H. P.



STANDARD  
D. C. MOTOR  
AND  
GENERATOR  
1-7 1/2 H. P.  
34-5 H. P.



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MOTOR  
1-5 H. P.

ROBBINS & MYERS, INC.

SPRINGFIELD • OHIO

HOISTS & CRANES • MACHINE DRIVES • FANS • MOYNO PUMPS • FOUNDED 1878

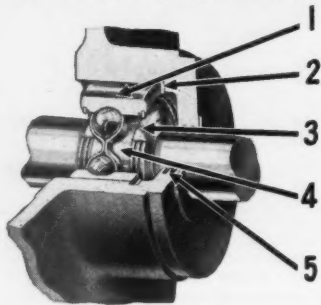
TURN PAGE  
for More Details!



## 3 OTHER IMPORTANT FEATURES

# MAKE ROBBINS & MYERS *Uni-Shell* MOTORS OUTSTANDING!

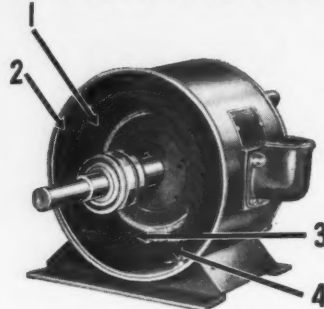
### 1. BETTER BEARINGS



1. Double-row-width ball bearing assures an adequate supply of lubricant. 2. Spacing washer. 3. Complete seal, both sides—held in by snap rings that are easily removed for inspection, cleaning and regreasing. The lubricant sealed in—can't sealed out! 4. Exceptionally large grease reservoir. 5. Annular grooves filled with water-resistant grease to exclude water, dirt, fumes and other foreign matter.

One of the two main reasons for motor deterioration is *bearing wear*. That is why we have gone "all out" on bearing standards, types, and alignment for Uni-Shell Motors. The bearing illustrated above is standard on all Uni-Shell ball-bearing motors. Equally important improvements have been made on sleeve bearings for Uni-Shell Motors requiring them. Highest-quality cast bronze bearings, with surfaces burnished to a high finish, are used in both wool-packed and ring-oiler types.

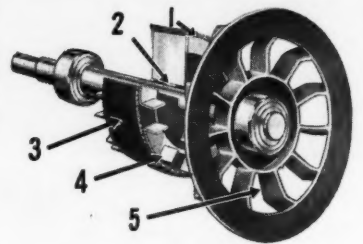
### 2. BETTER INSULATION



1. Two layers of highest-grade impregnated rag paper. 2. Wire itself coated with double-weight synthetic resin for strength and flexibility. 3. Added sheet of impregnated paper placed between coils in slot. Improved method used for holding end coils. 4. Entire winding assembly given several baked coats of synthetic resin-base varnish and covered with moisture-resistant synthetic resin and tung-oil sealer.

The second main reason for motor deterioration is two-fold: *poor insulation* and *excessive heat*. Consequently, throughout Uni-Shell Motors, we use the best insulating materials that can be purchased, incorporating the newer synthetic varnish treatments as outlined above. On all heat runs, temperature rise is measured by embedded thermo-couples to give the complete, *accurate* picture for each design. Heat vitally affects motor life. Our records show that Uni-Shell Motors give *better* than guaranteed values.

### 3. BETTER BALANCE and ROTOR CONSTRUCTION

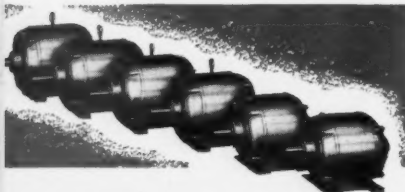


1. Welded or brazed bars and end rings are copper. 2. Rotor keyed to shaft. 3. Ground rotor surface assures uniform air gap and quiet operation. 4. Pressed-steel fans are used against rotor for larger ratings, as well as on totally enclosed motors. 5. Our fan engineering experience has been applied to designing and testing all fans used in the Uni-Shell. A measured flow of air is assured on all designs.

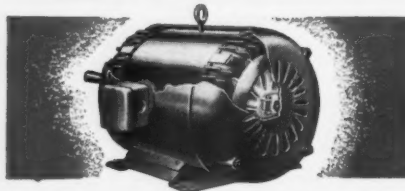
Good bearing alignment and rotor construction, together with precision balancing, prevent motor vibration that injures bearings and shortens their life. Three grades of rotor balance are available on all types of Uni-Shell Motors:

1. Static balance.
2. Commercial dynamic balance.
3. Special dynamic balance.

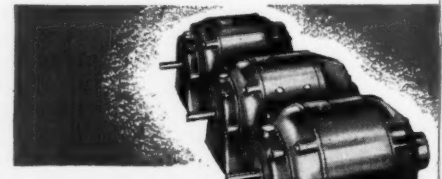
Precision balancing machines of the newest types are used in building Uni-Shell Motors. Vibrometers check the smooth-running performance of each one.



FROM SMALLEST TO LARGEST, all types of Uni-Shell motors look alike. From an appearance standpoint, this family resemblance" is a distinct advantage for manufacturers using different sizes and types of motors in motor-driven products and on production machines.

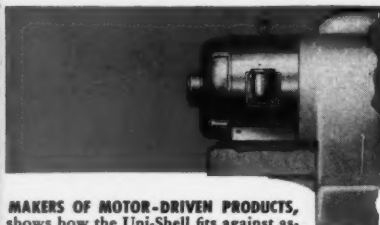


TOTALLY ENCLOSED, FAN-COOLED UNITS have covering shell that bolts to standard base, special ribbed end heads for maximum heat dissipation, and special fan that gives large flow of air between enclosed Uni-Shell Motor and outer cover. Cast conduit box is thoroughly gasketed.

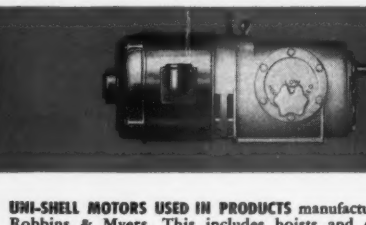


#### DRIP-PROOF, SPLASH-PROOF MOTORS

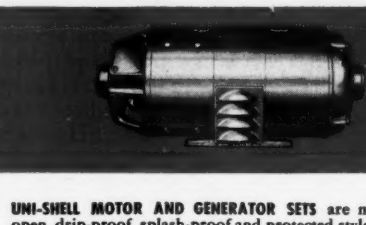
have covers added, or special heads. Left to right: poly-phase, direct current, and repulsion induction motors with covers.



MAKERS OF MOTOR-DRIVEN PRODUCTS, shows how the Uni-Shell fits against assembly. Whatever different types you use, no signing is necessary. All—in any one frame size—have identical shaft-head, shell, and mounting dimensions!



UNI-SHELL MOTORS USED IN PRODUCTS manufactured by Robbins & Myers. This includes hoists and cranes, Moyno pumps, and machine drives, all famous for their trouble-free performance. Buyers of these products also benefit from the Uni-Shell's interchangeability.



UNI-SHELL MOTOR AND GENERATOR SETS are made in open, drip-proof, splash-proof and protected styles. This totally enclosed union ring set, cooled by a unique principle, illustrates streamlined compactness made possible by Uni-Shell construction of both motors and generators.

## ROBBINS & MYERS, INC., SPRINGFIELD • OHIO

gentlemen: Please send me your new 20-page booklet on Uni-Shell Motors.

Name..... Position.....  
Company.....  
Street Address.....  
City..... State.....  
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**INDEX OF TRADE & COMPANY NAMES**—Complete with addresses. Starting with only a trade name or a company name, you can thus quickly locate the product data you need.

**A WORD OF EXPLANATION**—E-B-R is not sold, and is not offered as a premium for subscriptions to any magazine. It is distributed to a limited number of men directly responsible for the specifying or requisitioning of substantial amounts of electrical materials. We have a small reserve supply should a copy be urgently needed by someone directly connected with large scale war work. Other than that we regret we cannot add to our original distribution list.



**MCGRAW-HILL PUBLISHING COMPANY, 330 W. 42nd STREET, NEW YORK, N. Y.**

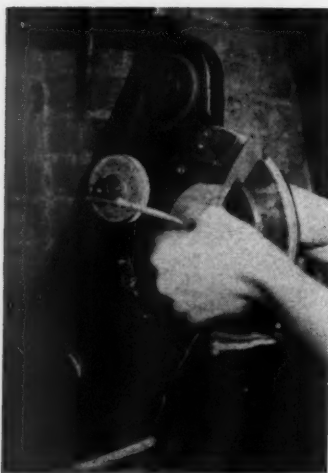
*Electrical Contracting, April 1943*

# Motor Shops

## MACHINE FOR TYING COIL SLEEVING

When the Independent Electric Machinery Co., Kansas City, Mo., motor service shop took on a subcontract to make several thousand stator coils, they attempted to speed up all operations possible. One of these was the fastening of color coded sleeving to the ends of the coils.

Formerly this was purely a hand operation. Shoemaker's cord was



**SLEEVING IS TIED** to coil ends by this converted tapping machine, making a smoother job in less time than by hand. Bobbin, substituted for roll of tape, is loaded with No. 40 thread.

wrapped around the sleeving and knotted. This was time consuming and left a definite "bump" on the coil.

To perform a much smoother job in a fraction of the time, Independent developed a machine for tying the sleeving with No. 40 thread. They simply took a large tapping machine and substituted a bobbin of thread for the conventional roll of tape. With the addition of a tension device to keep the thread taut it works just like a tapping operation.

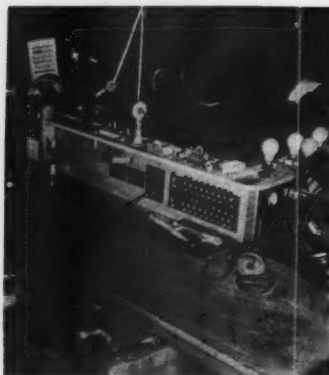
The bobbin is a fibre spool, 2½ inches in diameter and ½ inch wide, mounted on the moving rim of the machine.

For reloading, the bobbin is placed in a drill press or lathe and the thread wound on it. The tension device is nothing more than two brass washers on a spring mounted bolt. The thread is guided to and from the tension device by small wire "eyes."

The coil is held in the tapping machine in the conventional manner while the thread is wrapped around the sleeving on the coil end. When a sufficient number of turns have been applied the thread is snapped and knotted. One bobbin contains enough thread for about 200 coils. Spare bobbins are always kept loaded for quick replacement.

## CAPACITOR TEST BENCH

In one section of the motor repair shop of the Mielke Electric Works, Inc., Duluth, Minn., a workbench is equipped with rows of single-pole knife switches and a bank of small capacitors under the table top. Located in the small motor test department of the shop, this equipment is used to determine the proper size capacitor for small capacitor motor repairs.



**TEST PANEL** for capacitor type motors permits mechanic to determine the exact size of capacitor needed for proper motor operation. Unit is part of regular workbench in the small motor area of this shop.

The test panel contains a total of twenty switches, in a double row. One switch at the extreme left of each row is a short circuit switch. The other switches control a specified number of microfarads capacity. The capacity each controls, from left to right, is 1, 2, 3, 4, 8, 20, 30 50, 50. The circuits are so arranged that the capacitance is additive; for example; if all switches in one row were closed, the total capacity would be 168 mfd. The top row of test switches are connected in the same manner, so that as each top switch is closed it adds to the capacitance of the lower ones already in the circuit. Closing all top switches would double the capacitance provided by closing all lower switches.

Test receptacles are installed at both ends of the workbench to facilitate quick and easy testing and the use of short (40-in.) test leads. The bench backboard is topped by a narrow shelf to keep small tools and accessories up out of the way. Adjustable bracket lamps provide localized light wherever it is needed.

## FLOOD DAMAGE PROTECTION

Many laudable achievements have been made recently in the application of infra-red lamps to the dehydration of flood soaked electrical equipment.

Harry O. Murphy, Lloyd Smith Company, Bradford, Pa., had infra-red ovens built of lamps borrowed from far and wide before the flood waters had even receded enough for the removal of inundated equipment. The flood was of the flash variety which severely damaged much of northwest Pennsylvania last July. Harry handled as many as 100 small and fractional horsepower motors every 24 hours. Equipment came to him from all over the flooded area and all machinery was back in operation in an extremely short time.

Walter Everson, Everson Electric Company, Allentown, Pa., likewise did the impossible and saved thousands of man-hours on war production work. Infra-red lamps were borrowed from a Philadelphia warehouse to make up temporary drying banks which were in addition to his own banks normally used in coil production. When ravaging waters struck the Lehigh valley last May to take a tremendous toll of industrial machinery, Walter himself, rolled up his sleeves and began preparation for handling the soaked equipment which he knew would soon come pouring in. Because of the urgency to get war plants back into production every conceivable expedient was used. He leased all the available



# A WORLD OF POWER!



As one of the few great names in Electric Power, it has been the province of Crocker-Wheeler to pioneer in the application of Electric Motors and Generators for many individual industries.

Today . . . as a part of the greater Joshua Hendy Iron Works . . . our enlarged productive facilities and specialized knowledge are more than ever available to all war industry.

Crocker-Wheeler Electric Manufacturing Company, Ampere N. J., Division of Joshua Hendy Iron Works.



CROCKER-WHEELER

S I N C E 1 8 8 8



## PREVENT MANPOWER SHORTAGES

Industrial accidents are one reason for manpower shortages. And uncontrolled arcing is one cause of industrial accidents. That's why special safety features are incorporated in Federal Rolarc Safety Switches to control and reduce dangerous arcing to an *absolute minimum* . . . and to increase production by eliminating delays and accidents caused by switch failure.

The parallel cylindrical rollers which "dam up" and snuff the arc give these 575 Volt Rolarc Safety Switches many added advantages. This new method of arc control lengthens switch life — conserves war vital copper — saves valuable time and priceless manpower. Follow the leaders — for extra service and safety switch to Federal!



### For Complete Rolarc Data

Write for Bulletin 42-12. Contains all the essential facts on the 575 Volt Federal Rolarc Safety Switch.

### FEDERAL ELECTRIC PRODUCTS COMPANY

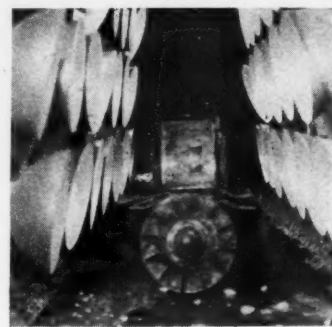
48 PARIS STREET, NEWARK, N. J.

PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

*Motor Shops*

[FROM PAGE 74]

empty buildings, hired several hundred workers, and began installing temporary ovens as fast as the lamps arrived. Substation equipment was handled first. Large industrial motors came next. Motors of over 200 hp. were cared for at their locations and the smaller ones were brought into the shop or leased buildings. A total of some 10,000 horsepower in large motors were handled. In addition some 200 substation pieces and 250 smaller stators, rotors and control pieces were dried out. Within 10 days 70 percent of all the emergency drying work was finished and a few days more cleaned up the entire job—an undertaking which would have taken months



**INFRA-RED OVEN** thrown together in several hours to dry electrical insulation, reducing loss-time production from weeks to one or two days.

if ordinary drying methods had been employed. The use of infra-red lamps alone expedited this emergency situation.

The recurrence of flash floods throughout the country has given great concern to industrial men everywhere. Industrial damage alone for the year 1942 which is directly attributable to flash floods amounts to an enormous figure. This estimated damage is broken down into two sources of loss. One, actual loss of goods, machinery, repair costs, etc., and two, loss of production until machinery is back in operation. In the majority of cases the latter by far presents the most formidable problem. All inundated machinery must be torn down, cleaned, lubricated and reassembled, but most important of all the electrical machinery must be treated to one further step, namely that of thoroughly drying the insulation. Regardless of whether the insulation is that of a low voltage holding coil or the V-ring of a 5,000 hp. motor commutator, it must be thoroughly dried until it meets all standard tests.

Many methods have been devised (and the majority of them in an emer-

# For CANTONMENTS DEPOTS

## AND OTHER WAR Construction

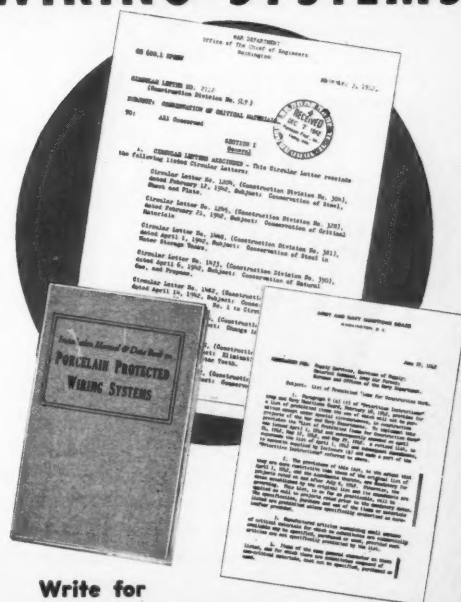


★ ★ ★ Modern

## PORCELAIN PROTECTED WIRING SYSTEMS

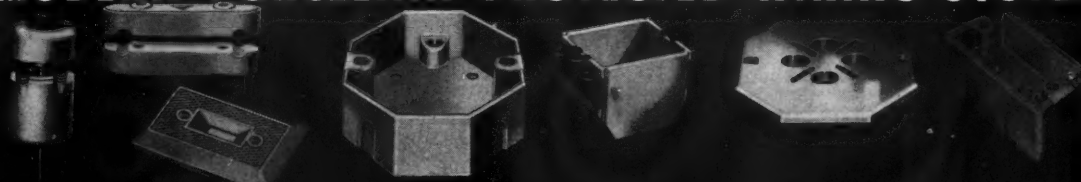
Compliance with directives as issued by the W. P. B., Army and Navy Board, and War Department in the matter of the prohibited use of critical materials in wiring installations will not prevent your handling immediate jobs. The reason is that Porcelain Products—used for 50 years—are not prohibited. You therefore aid in vital metal and rubber conservation and yet are able to make wiring installations for the most extensive projects.

Porcelain Protected Wiring System offer many advantages to both contractor and customer. For example, quick installations are accomplished—economical results are realized—complete insulation and protection from the entrance switch to the very last outlet on the system—short-proof and shock-proof qualities of porcelain contribute to dependability—rust and corrosion resistance characteristics make porcelain the ideal material in damp, wet, or dry locations—porcelain gives you permanency. For details write to the company closest to you listed below.



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## if You Don't Take Care of Tools

You are courting trouble if you misuse tools. The Army and Navy need hand tools—by the ton—to fight a global war. Few will be left for civilian needs at home. Tools misused or lost may be irreplaceable—it pays to take care of the ones you have.

As an aid to promoting longer tool life, we have prepared a handy, pocket size booklet containing helpful hints on the care of tools and suggestions for their proper use. A copy will be sent to any one interested, without charge—mail the coupon below.

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*Motor Shops*

[FROM PAGE 76]

gency) to do this insulation dehydration. They vary from the use of domestic cooking range ovens to scientifically designed infra-red ovens. While it is not always economically possible to purchase dehydration means merely for flood protection, it might prove very valuable insurance to know where such means would be available in the event of an emergency.

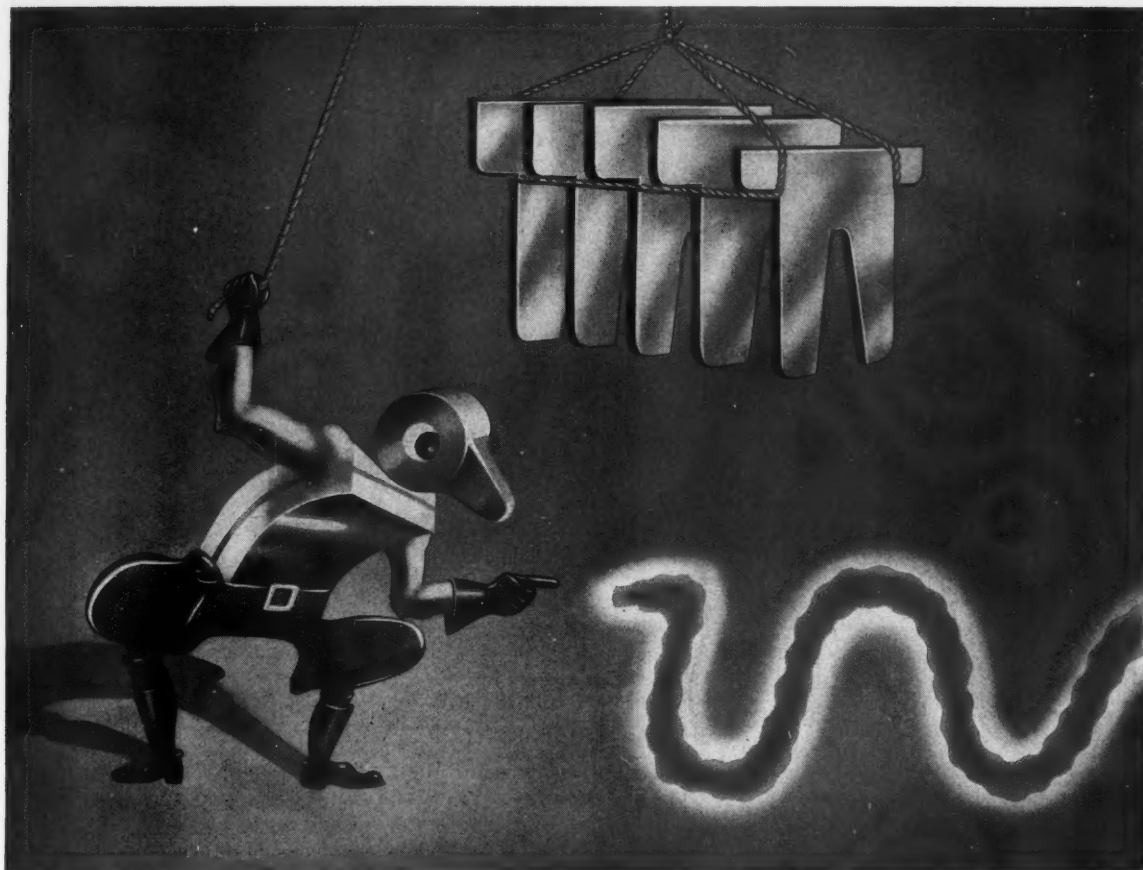
Infra-red ovens, especially portable units, have proven their superiority many times over for use in drying insulation that has been flood soaked. One of the more important aspects of successful drying is temperature regulation and elimination of hot spots. Burnt insulation can be just as detrimental as undried insulation. Temperature regulation can be held exceptionally close and heat can be very evenly distributed with or without the use of circulating fans even in a crudely built temporary infra-red oven. Another important feature is their portability. They can be applied to larger equipment at its operating location, saving many, many hours of dismantling, packing and shipping time.

However, most important of all is their speed of drying. Infra-red rays give deep penetrating heat. It dries from the inside out instead of the usual outside in process.

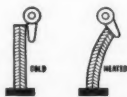


**WOMANPOWER** solves the manpower problem in the motor service shop of the Independent Electric Machinery Co., Kansas City, Mo. Five girls have already started training in coil making and light machine operations.

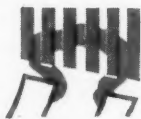
Electrical Contracting, April 1943



*"one false move and you're* **Dead!"**



**THIS IS THE BRAIN** that tells whether an overload is dangerous or not. It's Westinghouse Bi-metal. Two different metals which react differently under heat are bonded together. Dangerous overloads cause this Bi-metal to bend, tripping the interrupting mechanism, opening the circuit.



**THIS IS THE BRAWN** that quenches the arc. Made up of parallel metal plates in the form of a grid, it draws the arc into the chamber, divides it into segments and smothers it between the plates . . . it all happens in the space of half a cycle!



Current that gets out of hand and threatens equipment or power circuits gets short shrift when the circuit is protected by Westinghouse "De-ion" Circuit Breakers.

With uncanny accuracy, this "De-ion" protective device outguesses the current, beats dangerous disturbances to the punch. Momentary, harmless overloads are passed without interruption; but when the circuit is actually threatened, the sensitive Bi-metal element goes into action, *quick!* The circuit's broken, the arc quenched, in the space of a blink of an eye.

It protects itself, too. The fast action minimizes arc effects, lengthens contact life. Its factory-set calibration is not disturbed. And, when the interruption has been corrected, a simple flip of the indicating handle restores service in seconds. No time lost locating a busy maintenance man; no parts to repair or replace.

Protect equipment and electrical circuits with Westinghouse "De-ion" Circuit Breakers. Ratings to 600 amperes; enclosures for any type of service. Call Westinghouse today. Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

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PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

**"DE-ION" CIRCUIT BREAKERS**

ventilation ducts. All windows on the main laboratory buildings are on six-foot centers, and partitions of standard interchangeable, steel panels may run from the piers separating the windows. A six-foot corridor runs down the middle of the building on one side of the central row of columns, and on one side of this corridor the installation of partitions provides rooms 27 feet deep, and on the other, 19 feet. The partitions run from outer wall to corridor partitions, and rooms may be 12 feet wide or greater in multiples of 6 feet. This spacing of 6 feet has been referred to throughout the design and construction of the building as the 6-foot module.

#### **Power Risers**

Since the power risers are on 12-foot centers, it is possible to provide at least one 50-ampere 3-pole circuit breaker from which 120/208 volt single and three-phase power may be available for each laboratory room. From this breaker, branch circuits are run in wireways parallel to the outside wall in back of the wainscot to a location where the circuit is brought out through conduit at right angles to the outside wall to specially developed wire troughs hung on the surface of the partitions or to underfloor ducts. The wire troughs are attached to hangars in the space between partition panels in a manner that does not damage the panel. The wire trough covers are in unit lengths, and may be blanks or equipped with a variety of protected outlets having pigtailed that are connected to the feeder cables with squeeze type connectors. Small current-carrying leads may also be distributed in a space at the top of the partition and in vertical wireways between partition panels. Since most of the work requires numerous relatively low current outlets, this system serves the major demand. In locations where heavier current demands must be met, a lead is taken direct from a spare fuse in the basement column panel to the load, either in space in back of the metal column enclosures or in back of the outer wall wainscoting.

A number of special fittings have been developed to permit either single-phase or three-phase individually protected outlets of 10, 20, and 30 ampere capacities. The single-phase outlets are protected by individual breakers having the

outlet capacity, while the less frequent three-phase and direct-current outlets are protected by fustats. Direct current is obtained where necessary from small motor-generator sets installed in the attic, or by rectifiers installed locally in laboratory.

Power may be used directly from the outlets. This is generally done in the chemistry laboratory, where a number of other services equally important to electricity are installed, and where unit benches with varying storage facilities are provided. In the more numerous laboratories doing physical research and development, however, where the electric outlet is the primary service, a more simple type of unit bench is used, and the 15-ampere outlets are conveniently located at the top of the hollow metal bench legs. These bench leg outlets are energized by plugging cords into the protected outlets in the wire trough.

In the relatively few cases where island bench arrangements are desirable, a covered trench in the floor runs out from the center of each window to supply island benches with electrical and mechanical facilities. This has been made possible by laying on top of the structural floor arch and beneath the finishing concrete surface four inches of weak concrete fill. The floor is jointed to permit removal of fill and finish if the floor box installation is necessary.

The individual 10, 20, and 30-ampere breakers previously referred to were selected with inverse time and short-circuit characteristics that permit any and all of the small breakers to open on overload or short circuit without opening the 50-ampere main breaker. By this means continuity of laboratory power is maintained even if one outlet is accidentally short circuited.

The 50-ampere breaker, in addition to the inverse time and short-circuit trip, has a magnetic trip wire to a safety trip switch and has associated neon lamp indicators located above the lighting switches on the corridor door posts. The wiring for this emergency trip circuit is run through the partition wireway. This enables the whole laboratory power to be instantly disconnected in the event of a high-voltage accident or an electrical fire.

#### **Lighting**

To permit the installation of partitions subdividing the length of all buildings into rooms of any multiple of six feet, the lighting circuits had to be designed for switching in rows across the building instead of the conventional way in rows longitudinal to the building.

The circuiting had to be so designed that the switch leg brought to the switch at the corridor entrance to any given partitioned-off enclosure could be relocated without affecting the main building lighting, wiring, or switchgear when partitions and doors are rearranged. Three-phase 4-wire lighting cabinets were installed flush with the central columns on the corridor side. Each panel controls light for 12 feet on each side of the column for the entire width of the building.

Lighting fixtures were located centrally in the coffer produced by the beam construction of the floor slabs, and spaced 9 feet across the building and on a 6-foot spacing longitudinal to the building. This spacing brings one light over the center of the corridor, two in the short and three in the long laboratory rooms. The lighting panels were specially designed and wired to permit switch legs to be attached or detached from any circuits normally controlled from the column cabinet so as to allow lights within partition enclosed areas to be controlled from light switches located on the partition door posts. This was accomplished by bringing each live leg through a jumper-type terminal block wired into the panel. When switching from the lighting panel itself, terminal-block jumper strips complete the circuit. When switching from partition locations is required, the jumpers are removed and switch legs attached.

In large partitioned off areas, the number of partition door post switches are reduced to a minimum by the use of latch-in type magnetic switches arranged for installation in the main aisle lighting panel cabinet and wired across the terminal block.

#### **Installed Cost**

The percentage of the total building cost for electric power and light proved to be quite low, even when compared with more standard installations not having the fine regulation and flexibility incorporated in the Murray Hill design. An analysis of the reason for this indicates that the high percentage of useful loading of all secondary copper due to the short distances maintained between all loads and the points of secondary generation is partly responsible, while installation manhours were reduced by limiting conduit fittings and wire-size changes to a minimum, and by the use of solderless terminals and splice connectors throughout. The building design, laid out as it was to simplify and reduce the cost of running services, further contributed to the result obtained.



# Lighting and Power Circuits for research at Bell Telephone Laboratories protected by **HEINEMANN CIRCUIT BREAKERS**



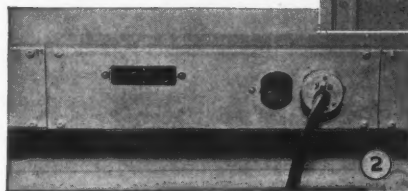
Where a diligent and never-ending search for new facts, figures and principles is a business, HEINEMANN *Fully-Electro-Magnetic* Circuit Breakers were selected for the important job of protecting power and lighting circuits. That is a tribute to the efficiency of Heinemann devices which open instantly on short circuits and dangerous overloads but permit harmless overloads of short duration.

**1** **THREE POLE BREAKERS**—Also available in single and two pole types with instantaneous trip or magnetic time delay. Ratings are from 50 milliamps. to 50 amps. on circuits up to 460 volts AC or 250 volts DC. Four different time delay curves to match characteristics of almost any circuit.

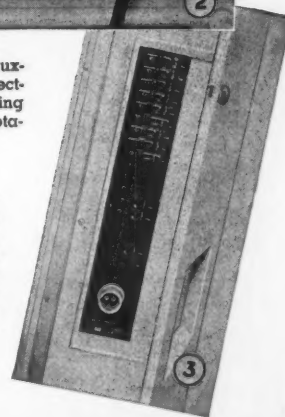
**2** **AUXILIARY BREAKER**—Outstanding for protection of fractional hp. motors. Ratings are from 250 milliamps. to 35 amps.

**3** **"MAGNETTE" PANELBOARD BREAKER**—These are furnished for assembly in lighting panelboards and made in ratings up to 50 amps. Their current carrying capacity is not affected by changes in temperature.

**Three Pole Three Coil Breaker**, with auxiliary shunt trip for remote control operation, protects power circuits. Remote control switch (at right) operates shunt trip. Sufficient current flows through shunt trip to neon light to show current is on. When breaker trips, light goes out.



Bus duct showing Auxiliary Breaker protecting circuits serving duplex 3 point receptacles.



Panelboard for lighting circuits showing "MAGNETTE" Panelboard breakers with locking devices to prevent tampering by unauthorized persons.

**Send for Catalog 40 Showing Complete Line**

## **HEINEMANN CIRCUIT BREAKER CO.,**

SUBSIDIARY OF HEINEMANN ELECTRIC CO.

**132 PLUM STREET**

Established 1888

**TRENTON, N. J.**

# Modern Lighting

## PAINT SPRAY AREA

In aircraft production there are many large sections which must be sprayed while travelling along on an assembly jig. The spray booths, consequently, are relatively large areas which require highly specialized lighting treatment. The light must be well diffused, of high intensity, yet luminaires, wiring and lamps must be well protected from the paint spray.

One western plant uses an interesting and effective lighting scheme as shown in the accompanying sketch. Continuous row, two lamp industrial fluorescent reflectors are mounted behind sealed glass panels in the sides and ceiling of the booth.

Each of five rows have five 52- by 12- by  $\frac{1}{4}$ -inch glass panels sealed against vapor in a frame flush with ceiling or wall. Strap iron hangers support the lighting units about one inch above the glass. The hangers are hinged on a  $\frac{1}{2}$ -inch pipe pin at one side and bolted to brackets at the other. This mounting allows the maintenance man to swing the unit away from the glass for relamp-

ing and cleaning without interfering with the sealed joints.

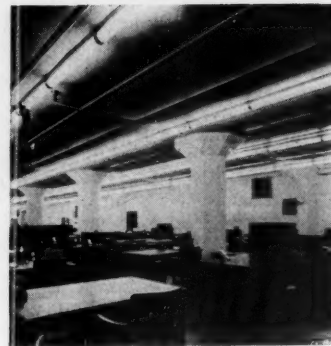
As a further safety precaution the spray area is maintained at a lower pressure so that any leaks which might develop around the lighting units would only permit air to be drawn into the booth. Vapor could not escape.

## REMODELED WITH LIGHT

Office work under inadequate lighting conditions takes a heavy toll in efficiency and lost manpower. The application of adequate engineered lighting is the equivalent of putting new life into eye-fatigued employees.

Substantial improvement in illumination was effected in the general offices of the Owens-Illinois Pacific Coast Company in San Francisco, by the installation of continuous strip diffused fluorescent lighting. The old installation consisted of ninety 200-watt enclosed glass incandescent fixtures mounted on 9- by 10-foot centers, 10 feet above the floor.

The remodeled lighting system is comprised of parallel rows of glass en-



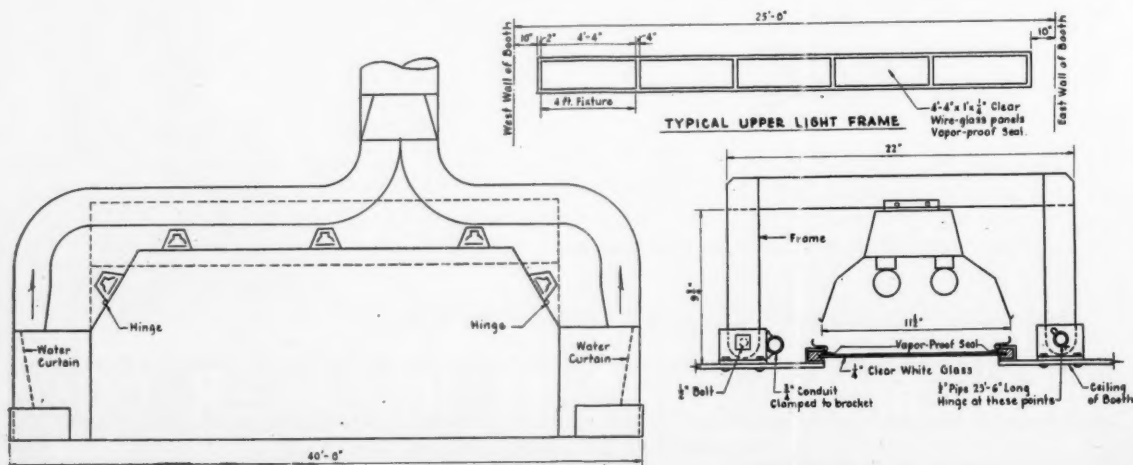
**NO MORE TIRED EYES** in this Pacific coast office since cool, diffused fluorescent lighting replaced incandescent globe fixtures. Present illumination is even and glareless.

closed continuous fluorescent units, each 8-ft. unit housing two 48-inch, 40-watt white lamps operated from two-lamp ballasts. A total of 104 type 2-CL-40 Westinghouse units and extensions housing 208 lamps light this office. Units are ceiling mounted 10½ feet from the floor with parallel rows on 9-ft. centers.

## LIGHTING A SCHOOL LABORATORY AND SHOP

The Macomber Vocational High School at Toledo, Ohio, is justly proud of its laboratories, shops and classrooms. The latest type of machines, identical to those found in factories, foundries and shops permit the students to study the latest shop practice.

Intensified instruction and schedules in both day and night classes require ample and correct light to facilitate the students in learning their selected trades.



**SPRAY BOOTH** lighting on a scale large enough for aircraft work involves fluorescent units behind sealed glass panels. Hinge frames allow ready access to the units for servicing.

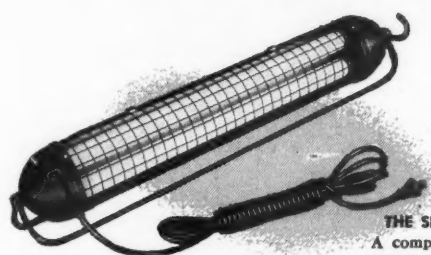
# Portable DAY-BRITE Fluorescent "Light Where You Want It"

## for Production, Inspection and Servicing Operations

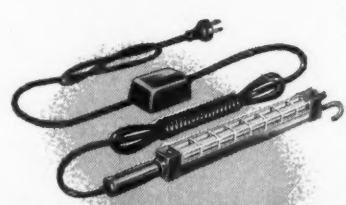


ADJUSTABLE  
5'-8" FROM FLOOR

**THE HIBOY . . . For four 40-watt lamps**  
Equipped with telescoping stand which is adjustable from five to eight feet in height. Swivel fitting at top provides adjustment in complete arc. Fixture body available with safety screen or vapor-tight cover. Large free-rolling swivel casters. Toggle switch control.



**THE SKIDWAY . . . For two 20-watt lamps**  
A compact, small-diameter unit, with safety-screen cover and clip-on reflector. Fixture is designed for rotating adjustment on skids, which also act as a horizontal support . . . Hanger hook at end allows vertical suspension . . . Manual starting switch.



**THE MIDGET . . . For one 6-watt lamp**  
For unusually small spaces . . . Furnished with hook for vertical hanging . . . Square shape prevents rolling . . . Manual starter . . . Ballast in separate box with wired-in cord.



**THE CRAWLER**  
For two or four 40-watt lamps  
The ultimate in portable illumination . . . Sturdy frame, with free-rolling swivel casters, cradles a substantial fixture body that also acts as a high light-value reflector . . . Fixture body is adjustable through 155° rotation. Has wire-screen or vapor-tight cover . . . Toggle switch control.

Patents Pending  
**DAY-BRITE LIGHTING, INC.**  
5433 Bulwer Ave., St. Louis, Mo.



THE SIGN OF QUALITY  
LOOK FOR THE LABEL



The COMPLETE LINE OF FLUORESCENT LIGHTING FIXTURES Nationally distributed through all leading electrical supply houses



**THIS IS THE FIRST TIME AN  
ADVERTISEMENT HAS  
EVER APPEARED**

*for...*



# BALLAST

**... yet it is one of  
America's Best Sellers**

## HERE'S WHY:

- 1 The many outstanding features of Superior Ballast have kept Superior facilities at peak operation—one satisfied user has told another until Superior has become synonymous with superior ballast. Recent expansion of Superior Electrical Industries facilities will now permit the manufacture of greatly increased quantities of these Custom Built Ballasts.
- 2 They are streamlined for a reduction in weight and ease of installation in the Ballast channel of the fixture.
- 3 The ends of lamps do not blacken as readily with Superior Ballast because of an improved result in the wave-form across the lamp. More lumens output per watt are provided than with other ballast of similar design.
- 4 Lamps are correctly balanced with Superior Ballast—the Ballast has an inductance of advanced design.
- 5 Reduced stroboscopic effect with Superior Ballast eliminates eyestrain and provides a more pleasing and more comfortable effect.

*write for information and details*

**Not just an ordinary ballast — it's Custom Built throughout!**

# SUPERIOR ELECTRICAL INDUSTRIES

**DEPT. A — 2614 W. NORTH AVENUE, CHICAGO, ILLINOIS**

**MANUFACTURERS  
OF  
FLUOR-O-CONTROL**



**QUALITY CONDENSERS, ELECTRICAL  
TRANSFORMERS AND SOLENOID  
WINDINGS OF ALL TYPES**

*Modern  
Lighting*

[FROM PAGE 82]

Soft, diffused light, brilliant enough for all working conditions, yet without glare, was obtained by using Westinghouse



**WELL LIGHTED** pleasant surroundings makes working in the electrical laboratory a pleasure. All test equipment is plainly visible in the 26-30 foot-candle illumination.



**WOOD WORKING SHOP** has between 25 and 29 foot-candles of diffused light at the light-topped work benches. Light paint on ceilings and walls increases the effectiveness of the lighting.



**REDUCED CONTRAST** between welding flame and surroundings is kind to the eyes in this welding shop. General illumination averages between 18-20 foot-candles.



**Clarence Birdseye's  
Lamp Invention Has Revolutionized Plant Lighting for the  
"Who's Who"\* of American Industry.**

# BIRDSEYE

## Reflector Lamps

Nothing yet designed equals Birdseye Reflector Lamps for projecting more light down to the working area, full force, without waste, without added line load.

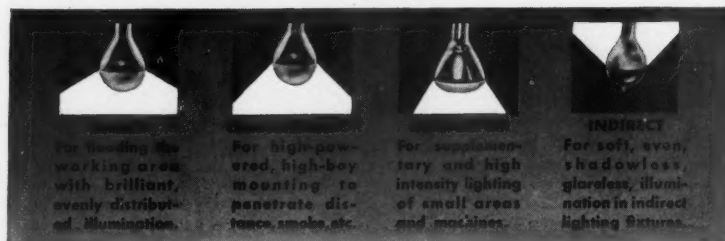
In contrast to separate lamps and reflectors, and misfit lamp and reflector combinations, Birdseye's perfect combination of reflector and precision-focussed filament scientifically controls illumination to project more light where it is needed most — to the "seeing" area.

### NO REFLECTORS NEEDED

Every Birdseye Reflector Lamp a COMPLETE luminaire lighting unit. No separate reflectors or fixtures needed.

### SAVES EXPENSIVE MAINTENANCE

Birdseye's pure silver reflector lining is SEALED INSIDE to remain brilliant always — never needs cleaning.



For flooding the working area with brilliant, evenly distributed illumination.

For high-powered, high-bay mounting to penetrate distance, smoke, etc.

For supplementary and high intensity lighting of small areas and machines.

**INDIRECT**  
For soft, even, shadowless, glareless, illumination in indirect lighting fixtures.

★ Allis-Chalmers, Bliss & Laughlin, Curtiss-Wright, Delco-Remy, General Motors, Johns-Manville, Republic Steel, A. O. Smith, Vultee Aircraft, Willys-Overland—to name just a few—have adopted Birdseyes after exhaustive tests in use. Birdseyes may solve your lighting problem. Write today for Booklet M-4, Wabash Appliance Corp., 345 Carroll Street, Brooklyn, N. Y.

# *"SEE-ABILITY"* FOR WAR



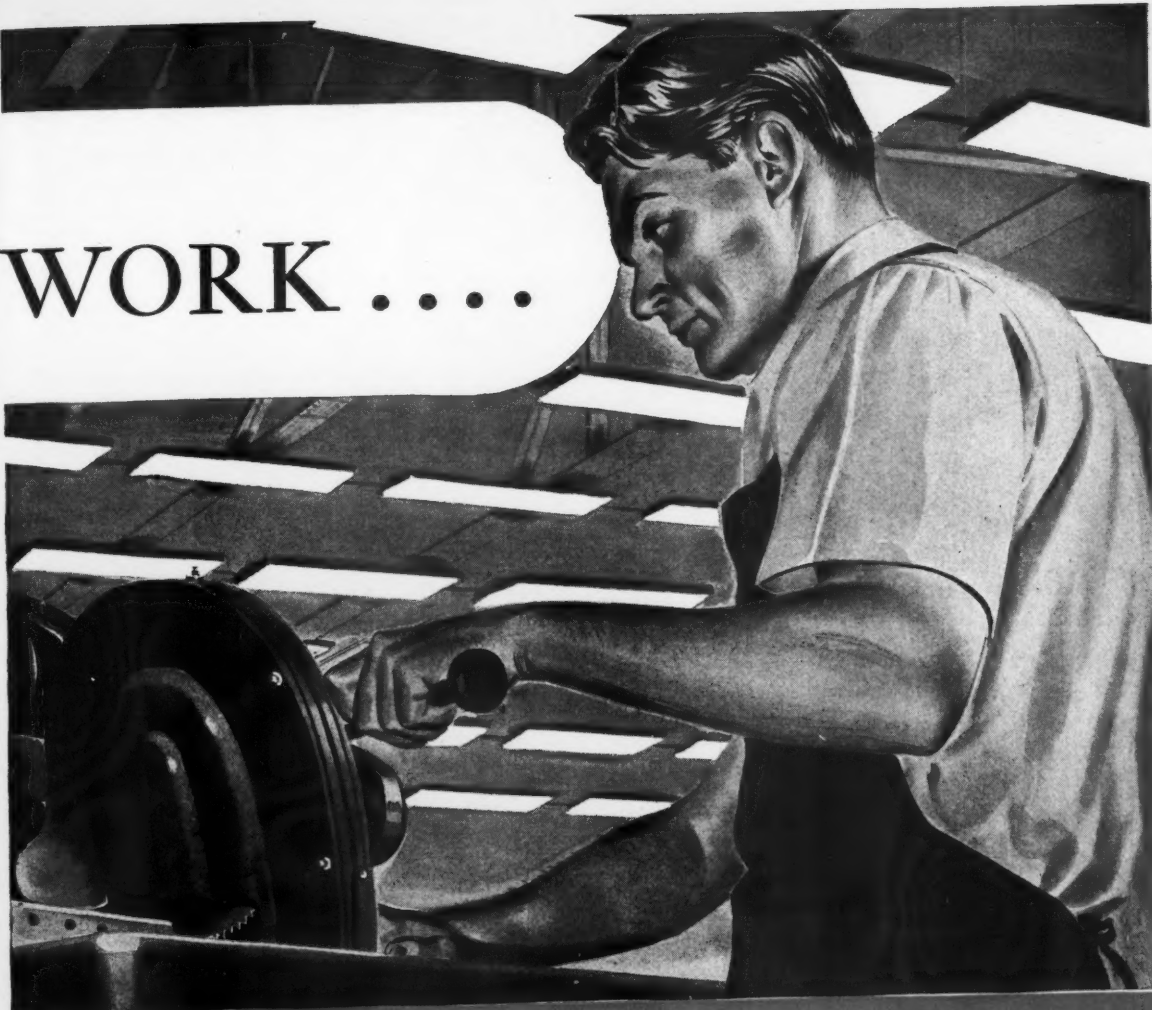
Our No. 1 job today is to provide the lamps needed for "See-ability" in our war factories. Good "See-ability" is a must if production is to be increased, accidents to workmen prevented, and accuracy in workmanship maintained. These factories require thousands of lamps. We are doing everything we can to make

*"SEE-ABILITY"* helps increase war production





R  
WORK . . . .



these lamps available. We are conserving the raw materials needed in lamp manufacture and we are asking every lamp user to conserve the lamps now in use. By making the tungsten, copper, mercury and other critical materials go farther, we can all help concentrate "See-ability" where it is needed most. Westinghouse Electric & Manufacturing Company, Bloomfield, New Jersey.

**Westinghouse**  
★ MAZDA LAMPS ★  
FOR GREATER "SEE-ABILITY"

# FLUORESCENT FIXTURES FOR WAR INDUSTRIES



## Meeting Latest W.P.B. Requirements\* . . .

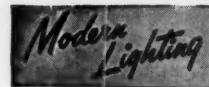
The entirely new OAMCO War Production Fluorescent line is designed and built for use in industrial plants doing essential war work that requires High Intensity Illumination. These new OAMCO units incorporate a number of improvements in design and construction that simplify installation, facilitate continuous row mounting, add to ballast life because of cooler operation and lessen wiring time. The reflectors are made of a rigid non-metallic material and have a baked double coat of glossy white chip-proof enamel that gives them a tough hard surface with a reflection factor of 85%. These fixtures are furnished in Double 40, Triple 40 and Double 100 units. Write today for complete facts on this new OAMCO line!

★ In compliance with the Amendment to Limitation Order L-78 40 Watt Units contain less than 3 pounds of steel per fixture. 100 Watt Units contain less than 4 pounds of steel per fixture.

**RIGHT LIGHT SINCE 1902**

**OVERBAGH & AYRES MFG. CO.**

MEMBER OF THE R L M STANDARDS INSTITUTE  
411 SOUTH CLINTON STREET • CHICAGO



[FROM PAGE 84]

Glassteel diffusers in the various shops, with units spaced to provide the necessary intensity for the task at hand.

Examples of the lighting in a few of the departments are shown in the attendant photographs. The electrical laboratory (Fig. 1) is equipped with 500-watt diffusers on 10-foot centers providing an average of 30 foot-candles under the unit and 26 between units. The carpenter shop (Fig. 2) is illuminated by 300-watt diffusers which produce an average of 29 foot-candles under the luminaires and 25 between them. Instead of being allocated to a poorly lighted, dingy room, the welding shop is lighted by 300-watt diffusers at an 11-foot mounting height. Intensity is 20 foot-candles under the units and an average of 18 foot-candles between them.

## FLUORESCENT OFFICE LIGHTING

Three distinct types of fluorescent lighting—direct, semi-direct and totally indirect were used in these offices located in the East, Middle West and Pacific Coast.

Direct fluorescent units (Fig. 1) replaced incandescent fixtures at the remodeled offices of the Foxboro Company, Foxboro, Mass. Here 55 Westinghouse two-lamp units, each using two 40-watt, 49-inch daylight lamps, operating at 118 volts on a single-phase a.c. circuit, provide 50 foot-candles of illumination at desk level. The fixtures are mounted on 9-ft. centers and 9 feet above the floor. Approximately 4400 watts is required to illuminate 4800 square feet of floor space.

Semi-indirect type, glass enclosed



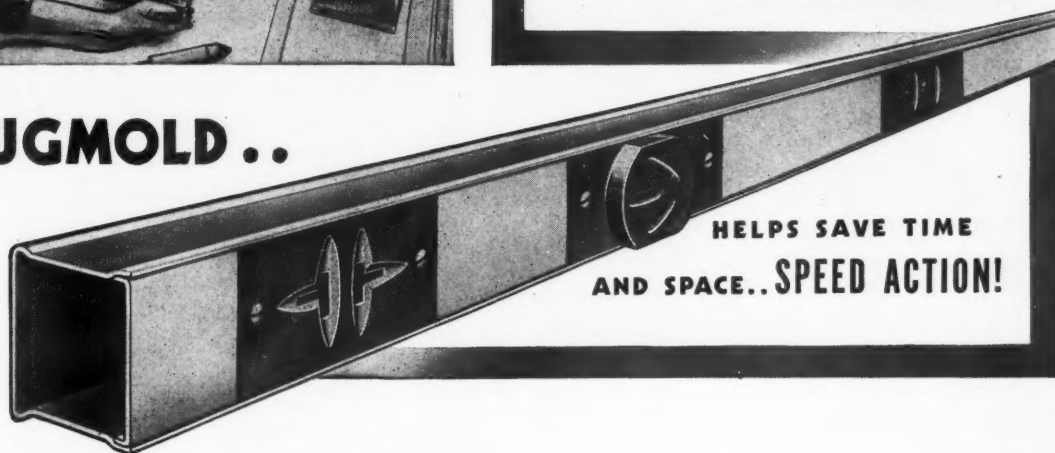
**DIRECT TYPE** two-lamp 40-watt fluorescent units bathe this Massachusetts industrial plant office in 50 foot-candles of illumination at desk level. (Fig. 1)

## ON THE PRODUCTION LINE . . .



YES . . . AND ON THE FRONT LINE

## PLUGMOLD ..



HELPS SAVE TIME  
AND SPACE.. SPEED ACTION!

The GIRL in our picture doesn't have to duck down underneath the bench or disturb her neighbor to reach the "nearest" electrical outlet for her drill. She merely plugs into the Plugmold outlet right at her station. And if she wants to connect the soldering iron or a test meter at the same time, another Plugmold outlet is right there, too. No need to tell you how that saves lost motion, cuts work time and fatigue, ups production substantially.

And the BOY in the picture, in a mobile shop

unit, out on the *front* line, finds Plugmold right there behind the benches to help him save time and speed work, too.

Better get to know this unique convenience wiring system that's complete with fittings for 3-wire industrial applications . . . a helping hand in production today that will be increasingly important in every factory, store, public building and home tomorrow. Listed by U. L.; conforms to Federal Specification W-R-32. The Wiremold Company, Hartford, Conn.

## WIREMOLD

CAN HELP YOU PRODUCE FOR **WAR** AND PLAN FOR **PEACE!**

### "HELPING HAND" LITERATURE FOR CONTRACTORS AND PLANT OPERATORS

- ☐ Bulletin, "Wiremold Industrial System-Wiring Speeds War Production".
- ☐ Engineering Data Sheets No. "3000" System Wiring for Industrial plants.
- ☐ Engineering Data Sheets, Plugmold Multi-Outlet Wiring Systems.
- ☐ "Pancake" Wiremold Overfloor Wiring System for Office and factory.
- ☐ Wiremold Catalog and Wiring Guide.

CHECK and return with your name and address





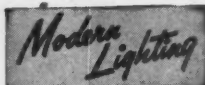
NO. 1184-M  
RLM THREADED  
DOME REFLECTOR

★ QUAD Units all have correct basic design and construction features. The RLM Label on QUAD Lighting Units assures your customers of modern, correct, and high quality commercial and industrial lighting. It's the line that will be popular tomorrow as well as today.



QUADRANGLE MFG. COMPANY

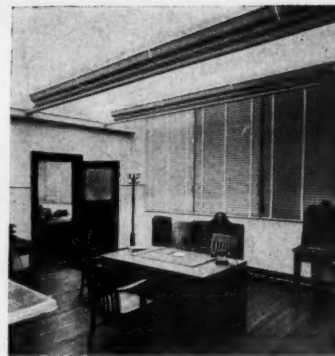
Mfgs. of Incandescent and Fluorescent Lighting Equipment  
32 SO. PEORIA ST. CHICAGO, ILL.



[FROM PAGE 88]

fluorescent strips provide 35 foot-candles of glareless diffused light at the Frederick Post Company office in Chicago, Ill. The units are ceiling mounted in parallel rows on 6-foot centers.

Totally indirect fluorescent lighting was installed in the chief engineer's office, drafting room and sales and general engineering offices at the plant of the Enterprise Engine and Foundry Co., San Francisco, Calif. This was accomplished by inverting Westinghouse open end units designed for continuous strip mounting. Each unit houses two 40-watt 3500 degree white fluorescent lamps. In the chief engineer's office (Fig. 2) twelve of these units mounted in three parallel rows of four units each provide



**INVERTED OPEN END** two-lamp fluorescent units provide an average of 31 foot-candles of totally indirect illumination in this chief engineer's office at a Pacific coast plant (Fig. 2).

an average of 31 foot-candles of illumination on the desk tops. Average mounting height is 9 feet and the rows are on 6½-foot centers.

## Lighting A MACHINE TOOL FACTORY

**PROBLEM:** To provide suitable lighting for safe, efficient seeing in a machine tool factory.

**CONSTRUCTION DATA:** The room is approximately 200 by 300 feet, and the ceiling is 20 feet high. Walls and ceiling are painted flat white.

**SOLUTION OF PROBLEM:** General illumination is provided by prismatic glass reflectors which alternately contain a 400-watt Mazda H lamp and a 500-watt Mazda C lamp. The fixtures are spaced on 14-ft. 4-in. by 10-ft. 8-in. centers and are mounted 15-ft. 3-in. above the floor.

**RESULTS:** The average general illumination provided is 35 foot-candles in service.

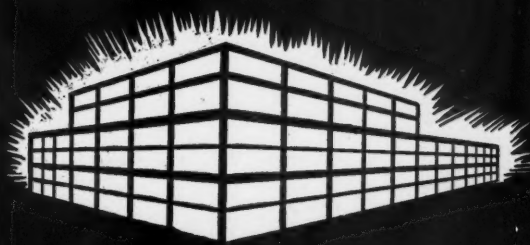


**STAGGERED ARRANGEMENT** of Mazda C and Mazda H lamps in prismatic glass reflectors are used for machine tool shop.



**GENERAL ILLUMINATION** of 35 foot-candles is provided by using plenty of flat white paint on ceiling and walls to supplement good layout design.

# PREVENT BLACKOUTS



## of War Production with RLM DOME REFLECTORS

Engineered to Provide Lighting  
That Will Not Fail



*The RLM Label has  
stood as a sign of qual-  
ity in Industrial Light-  
ing Reflectors for more  
than 20 years*



Air raids aren't the only cause of production blackouts. Too little light, lighting that causes eyestrain and fatigue, lighting equipment that fails under severe service, etc. may "blackout" war production as disastrously as a Hitler-inspired bombing.

Dome Reflectors engineered and built to RLM Specifications . . . certified by the RLM LABEL . . . provide maximum insurance against war production blackouts caused by lighting equipment failures!

One of the important factors in the blackout-preventing superiority of the RLM Dome Reflector is the fact that it is an all-porcelain enameled reflector. Porcelain enamel's high-lighting efficiency, high diffusion and light distribution, durability under severe service makes it the most practical and most satisfactory of all known reflecting surfaces for most industrial lighting purposes . . . the

only surface that gives consistently satisfactory results in many locations.

RLM Dome Reflectors are designed and constructed with that extra safety factor vital war plants demand of their lighting equipment. They are unaffected by mechanical strains, smoke, fumes, grime, dust and atmospheric conditions. Non-porous, easily cleaned and restored to original efficiency . . . fade-proof, non-peeling and non-breakable. Porcelain Enameled Dome Reflectors made in accordance with RLM Specifications assure highest lighting efficiency, maximum power conservation, lowest maintenance cost and greatest protection against lighting equipment failure.

For full particulars write any manufacturer of RLM Industrial Lighting Units, or RLM Standards Institute.

*The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers*

**RLM STANDARDS INSTITUTE**  
INCORPORATED

# Questions ON THE Code

Answered by  
**F. N. M. SQUIRES**

Chief Inspector New York Board of Fire Underwriters

## Size of Panel

**Q.** "I have a government job on which I plan to use a multi-breaker panel having a 50 ampere main breaker for the service switch and six 15 ampere circuit-breakers for the branches. The government has asked me to find out if such a panel meets the Code requirements."—A.B.H.

**A.** It may and probably does. There are, however, two deciding factors which must be ascertained.

*First*—The panel must bear the label of Underwriters' Laboratories and if the main breaker is to be used as a service switch, the label must be marked to show that it is suitable to be used as service equipment.

*Second*—The load to be placed on this panel must be calculated according to Section 2203 of the Code, in order to see that the 50 ampere main breaker is heavy enough to carry the calculated load. If the calculated load figures out to not over 50 amperes per leg, the 50 ampere panel will be suitable but if it exceeds 50 amperes then, of course, one with a larger main switch will be necessary.

Always remember that all panels must be tailored to fit the job and this should be worked out by the contractor and the inspector.

## Condensation Trouble

**Q.** "I have been called in to make repairs to wires in conduits where short circuits have occurred. The wires, when pulled out, seemed to have been wet. How can I prevent this trouble from occurring again?"—K.G.H.

**A.** First find the cause. If there is any place where water or mois-

ture can enter the conduit that should be remedied. Probably the moisture is caused by the condensation of warm air passing through the conduit and coming into contact with a cooler portion of it. If this is the case, the condensation of moisture can be prevented by stopping the circulation of the air within the conduit.

Often caulking or sealing the ends of the conduit runs will take care of this condition but if there is considerable air space which is not well filled up with wires in large conduits, convection air currents may flow within the conduit. Where such a warm current of air comes in contact with a cooler portion of the conduit, moisture will condense. In this case it may be necessary to place pull or splice boxes in the conduit run and then seal the end of the conduit.

Section 3041 of the Code requires that where portions of an interior raceway system are exposed to widely different temperatures, provision shall



**ENGINEER-ESTIMATOR, L. I. Horwitz, of the Malko Electric Company, Chicago, tells his fellow contractors about the electrical construction methods his company recently employed on a large coast to coast radio broadcasting station. Supervision of the electrical work was under his direction.**

be made to prevent circulation of air from a warmer to a colder section through the raceway. The circulation of air from a colder to a warmer section, does not have to be prevented as this does not cause condensation.

## In Hazardous Locations

**Q.** "I have heard that threaded couplings are now approved with electric metallic tubing. Can we therefore use this thin wall conduit in hazardous locations?"—W.E.

**A.** No. Under the provisions of the 1940 Code, electric metallic tubing is not permitted as a wiring method to be employed in hazardous locations.

Had a new 1942 or 1943 Code been promulgated, probably this tubing would have been permitted in some locations having lesser hazards than others but such rules, while recommended by the Article 500 Committee, are not as yet in effect.

A revision of the 1940 Code rule has however, been made in reference to the coupling used with electric metallic tubing, for wiring in non-hazardous locations. This is by Interim Amendment No. 51 which permits threaded "fittings approved for the purpose."

The threads are not of standard pipe thread dimensions and the connector has to be so designed as to prevent bending of the tubing at any part of the threads.

## Airplane Hangar Wiring

**Q.** "I am estimating on an airplane hangar job but do not find rules in the Code covering this subject. I will appreciate any information as to what rules to apply."—R.F.D.

**A.** This matter has come up many times during the past and had not the war come along, would have been given attention in the Code. Many Inspectors had applied the rule for garages to hangar wiring as airplanes carry gasoline and therefore the garage rules seem to be the most applicable. However, the Airlines people felt that their hangars should not be compared with garages on account of the wide open spaces in hangars with lots of ventilation and with very general good house-keeping.

While all of this was admitted, inspection authorities kept in mind the extra highly volatile gasoline used in



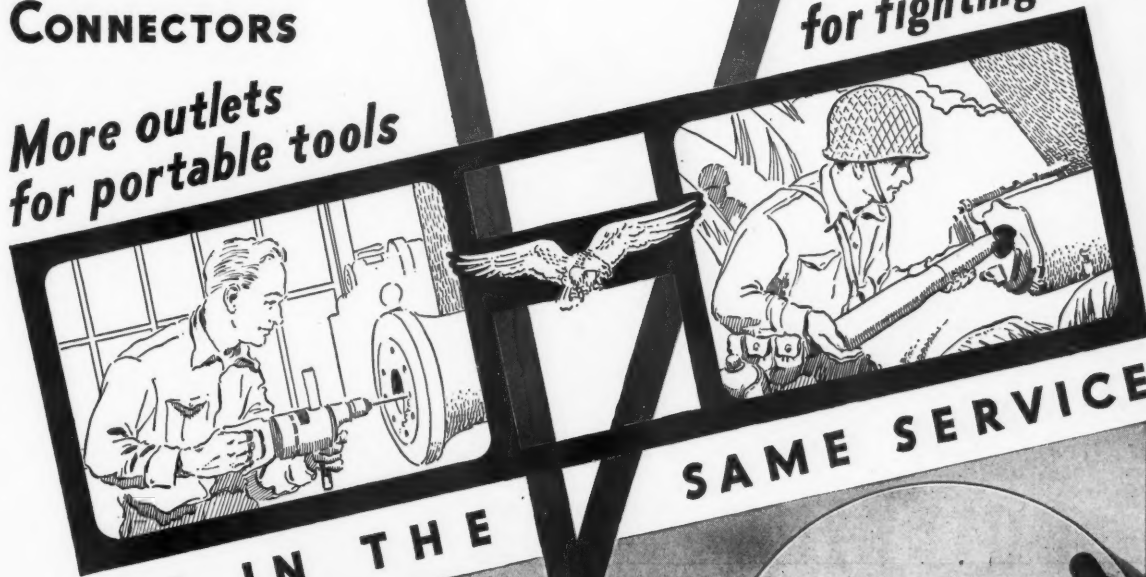
# H & H

# POLARIZED RECEPTACLES

## PLUGS and CONNECTORS

*More outlets  
for portable tools*

*More output  
for fighting tools*



**ALL IN THE**

**SAME SERVICE**



Give more power to MAN-power through more Outlets for portable tools! Add to flexibility of plant-equipment with additional power connections for light machines! Here's a way for the electrical Contractor or plant electrician to extend production facilities,— to further "energize" manufacturing operations or plant-conversion jobs.

H & H provides many popular types of Polarized Receptacles, Plugs and Connectors, — built for rough handling in war-driven manufacturing. Two, three and four-wire devices, in 10, 20, 30 and 50 Ampere capacity. Shown here are a few representatives of our complete line for Industry's current needs.

**HART & HEGEMAN DIVISION,  
ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN.**



## G-E BUILDING WIRE FOR WAR-PURPOSE WIRING

HIGH QUALITY • EASY STRIPPING  
CLEAN STRIPPING • EASY PULLING

G-E easy-to-use, high quality building wires are suitable for all types of war wiring. Six grades of insulation are available: Type R, Code grade; Type RP, Performance grade; Type RH, Heat Resistant grade; Type RW, Moisture Resistant grade; Type EG, Neutral conductor; Type SN, Flamenol\* small diameter synthetic insulated.

The finest of raw materials are used in making these wires. Manufacturing is carefully done. Accurate centering of conductors is provided by continuous vulcanization of insulation.

High quality G-E single- and multi-conductor lead sheathed wires and cables are also available. Special precautions control the thickness of the lead and the centering of the cable.

For further information see the nearest G-E Merchandise Distributor or write to Section W431-8, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Conn.

\*Reg. U.S. Pat. Off.

**GENERAL  ELECTRIC**

*Questions  
in the Code*

[FROM PAGE 92]

airplanes and the high values involved in case of fire. They felt that these latter considerations, kept the balance in favor of their requirements. Because of this controversy, this matter was referred to the Article 510 Committee on Garages, to either recommend appropriate rules for hangar wiring or to incorporate hangars into their garage rules. The latter was done.

The Article 510 Committee recommended that the Scope of their article read as follows:

"510. Scope. The provisions of this article shall apply to airplane hangars, garages, commercial garages, gasoline service stations and other locations where gasoline or other highly volatile motor fuel is stored in vehicles, dispensed, or where service and repair operations are carried on with this type of equipment."

These proposed rules then require that all electrical equipment within four feet of the floor be of the explosion-proof type. Of course this has been the garage requirement for years.

Because of the emergency, these proposed rules have not been acted upon but they do give inspection authorities firm basis for applying garage rules to hangar wiring.

However, because of the emergency it has been practically impossible to obtain explosion-proof motors and some inspection authorities have permitted that motors which cannot be located



**AIR BASE WORK** has been keeping A. B. Whitmer of ABC Electric Co., Lincoln, Neb., busy. Art did a good portion of the barracks and line work at the base near Lincoln.

# Speeding War Production

## —ready to serve you

Non-Ferrous M-G Morlite  
Composition Reflectors



## Martin-Gibson Luminaires for Fluorescent Lighting

Two and three 40-Watt and 2 100-Watt luminaires in both individual and continuous run types. All featuring high-reflection factor (89 to 91%); reduced weight of non-metallic reflector (43% lighter than Porcelain enamelled steel); streamlined continuous wire-way and simplified installation and maintenance. Grey baked enamel finish on outside, white baked enamel reflector.

*Just one of many interesting items in our new catalog.*

Martin-Gibson Company has been busy furnishing lighting equipment for big plants, but we consider that good lighting is just as important to the small manufacturer doing war work. So please don't think we're too big to be interested in orders for one, five, ten or twenty-five units. We value such business highly. We will be glad to serve your requirements, whatever they are, through your jobber, of course, with necessary priorities.

*Our new 1943 Catalog is creating a sensation.* Shows the complete Martin-Gibson line and the non-ferrous types of reflectors in full variety. Write for it today.

**Get this 1943 catalog**

### A Few Prominent Users of Martin-Gibson Office and Industrial Lighting Equipment

Boick Aircraft Engine Plants  
Thompson Aircraft Products Company  
Ford Tank Plant  
Fisher Bomber Plant  
U. S. Army Air Corps  
Bendix Aviation Corporation (8 Cities)  
Diesel Engine Div., General Motors Corp.  
Scintilla Magneto Corporation  
Warner & Swasey Company  
General Motors Building, Detroit  
Poliak, Inc.  
American Steel Casting Company  
Quincy Pump Company  
Pitt & Whitney Aircraft  
Curtis Wright Corporation  
American Locomotive Company  
United Aircraft Corporation  
Packard Motor Car Company  
Haynes Stellite Corporation  
Bohn Aluminum & Brass Corporation  
Timken-Detroit Axle Company  
Chrysler Corporation  
Oldsmobile Div., General Motors Corp.



# MARTIN-GIBSON CO.

999 HARPER AVENUE

DETROIT, MICHIGAN



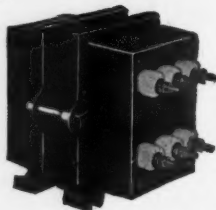
# YOU CAN'T STUMP *Newark* ON A TRANSFORMER JOB



Oil Cooled Transformer  
for Plate Supply Fur-  
nace, Welding, etc.

Is it a tough job of special transformer design? We have a 20 year record of success in licking jobs like that, and those 20 years of hard-won experience are valuable insurance of success on your job. Let's talk it over.

Is it a problem of quick delivery on standard dry type transformers? While we are not making wild promises, we do have the knack of getting things done, a reputation for getting them done on time, and usually maintain a stock of standard transformer quality components that helps us to do it. We won't make promises unless we can make good. Let's discuss it.



For Electronic  
Applications

Full details on Newark Transformers, Dry Type or Oil Cooled Distribution Type, in descriptive bulletins on request.

# *Newark*

**TRANSFORMER CO.**

**17 FRELINGHUYSEN AVE.**

**NEWARK, NEW JERSEY**

## SUBCONTRACT FACILITIES

at your service —

Our Subcontract Division has available floor space, machines, skilled operators and experienced engineers to help you meet delivery needs on war production. Established long before Pearl Harbor, and clever at cutting corners without cutting quality, where time is the vital factor. Ingenious, too, at meeting a variety of exceptional manufacturing problems. Our facilities may be just what you need—a 'phone call will verify it.

**Phone: BIGELOW 3-5600**

**NEWARK TRANSFORMER CO., 17 Frelinghuysen Ave., Newark, N. J.**

*Questions  
in the Code*

[FROM PAGE 94]

more than four feet above the floor, be of the multi-phase induction type having no sliding or arcing contacts.

Before deviating in any way from the Code requirements, permission to do so should first be obtained from the Inspection Department having jurisdiction.

### Acetylene Generating Room

**Q.** "In a plant which I am wiring, they generate acetylene gas for welding and cutting purposes. The generating room is quite small, but of course they desire lighting in it. What sort of lighting equipment must I use?"  
—T.M.M.

**A.** As there is a very great probability that there will be a quantity of acetylene gas free in the generating room especially when the generators are opened for cleaning and recharging, this room should be classified as a Class 1, hazardous location. This, then, would require the use of explosion-proof lighting fixtures.

But reference to the Laboratories' list of Inspected Electrical Fittings discloses that there are no fixtures listed for use in Class 1, Group A atmospheres which contain acetylene. Therefore, as there are no suitable fixtures listed, we should not install any in this location.

As the room is small, a window in the wall or ceiling can be provided, fitted with wired glass behind which a lighting fixture can be installed. By this method sufficient illumination can be provided.



**WORK IS CLOCKED** at Schneider Electrical Works, Omaha, Neb. Shop superintendent R. N. McLaughlin registers starting time for a rewind job on the job ticket. Starting and finishing time on each phase of work is registered to secure accurate labor breakdown costs.

# "When the lights go on again

All over the world"... and  
Americans may once more  
enjoy without restraint  
the bounty of their science  
... a new era in lighting  
will open.

Millions of Electro's Fluor-O-  
Masters will pour their  
cool, clear light over our  
homes and peacetime indus-  
tries... For fluorescent is  
the light of the future—and  
Fluor-O-Master is fluo-  
rescent at its best.

Meanwhile, Electro leads  
in supplying lighting  
for war plants, and is  
doing important research  
on air corps instruments.

Newest Electro achievement  
will be described in next  
month's ad—A REVOLU-  
TIONARY NEW INDUSTRIAL  
FLUORESCENT in the  
Fluor-O-Master Bomber line  
... This new unit is more  
versatile, more efficient, yet  
uses less metal than any  
other on the market.



## ELECTRO

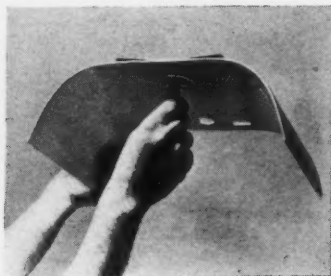
MANUFACTURING  
COMPANY

# EQUIPMENT *News*

THESE ANNOUNCEMENTS of new equipment are necessarily brief—for more detailed descriptions, sizes, prices and other data write to the manufacturers' advertising departments, tell them in what issue of **ELECTRICAL CONTRACTING** you saw the item and they will send full details to you.

## Latch

The "Captive Latch" is a powerful spring-type fastening that holds the reflector securely to the top housing. It was designed to save time and trouble in installing and cleaning its new line of composition reflector fluorescent fixtures. The latch requires only a quarter turn to remove the reflector. No tools are needed and, since the latch is an integral part of the top housing, it cannot become loose and drop out. The latch is inconspicuous in its position between the lamps and does not affect the appearance or efficiency of the reflecting surface. Sylvania Electric Products, Inc., Salem, Mass.



SYLVANIA CAPTIVE LATCH

## Ballast

A new three-lamp, 40-watt, high power factor ballast for fluorescent lighting of war plants is available. The use of one ballast instead of two simplifies installation and reduces the amount of wiring required for connections. The new ballasts are designed to operate on lighting circuits of 110-125, 199-216, 220-250 and 240-280 volts. Power factor is 90 percent or above. General Electric Co., Schenectady, N. Y.



G-E FLUORESCENT BALLAST



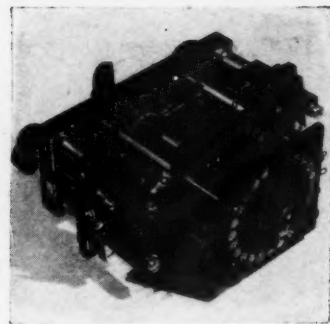
RELANCE LIGHTING UNIT

## Machine Lighting Units

A new line of "Swivelier" machine-lighting units has been announced. Some of the features and advantages are—unaffected by machine vibration; stays put at any angle; no set screws or wing nuts to adjust; wire completely enclosed in unit; choice of arm lengths; choice of base and socket combinations. The swivel base and socket each have wide range of movement. Socket adjusts to full 90-degree vertical range and rotates full 350 degrees horizontally; arm in base also has 90-degree vertical adjustment and 350-degree horizontal range. Unit is oil and dust resistant. Reliance Devices Company, Inc., 510 Sixth Avenue, New York City.

## Paints, Cloth and Tape

New phosphorescent paints, cloth and tape are available. They glow in the dark long after surfaces have been activated by either natural or artificial light. It is known as Phosphorseal and is recommended for use in shipbuilding plants and industrial factories. It is made in two colors, a blue and a green. Century Lighting, Inc., 419 West 55th Street, New York, N. Y.



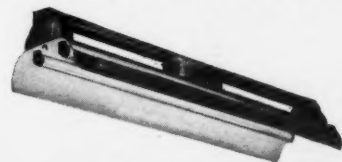
WESTINGHOUSE SWITCHES

## Switches

For control of airport runway lighting, a new line of switches, including the runway selector switch and the brightness selector switch has been developed. Both types incorporate mechanically interlocked preset switches. The runway selector switch, designed for the selective control of runway contact lights and floodlights, consists of a two-stage rotary type switch. Mechanically interlocked with the selector switch are two double pole, single throw, preset switches wired to permit the operation of contact lights along runway; any group of floodlights; or any group of floodlights and corresponding runway contact lights, as desired. The brightness selector switch is a five position switch for selection of five stages of brilliancy of the runway contact lights. Located adjacent to, and mechanically interlocked with it, is a double-pole, single throw spring return latch switch, with spring return to the "lock" position. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

## Fluorescent Fixture

This new line of fluorescent lighting fixtures, known as the Mitchelite, meets the WPB and U.S. Bureau of Standards regulations. Each model can be used for both individual and continuous row lighting, for surface or suspension mounting. A new type, easy-fit wireway channel simplifies the wiring and mounting for continuous rows. It also permits locating ballast on "outside". Reflectors are non-metal "Lumenite". It is available in four models—for two 40-watt lamps; three 40-watt lamps; two 100-watt lamps and a two section unit for four 100-watt lamps. The two 100-watt lamp model is for line voltage only and the others are for standard operating voltage of 110-125 volts, 60 cycle, a.c., but also available in higher voltages. Mitchell Manufacturing Co., 2525 N. Clybourn Ave., Chicago, Ill.

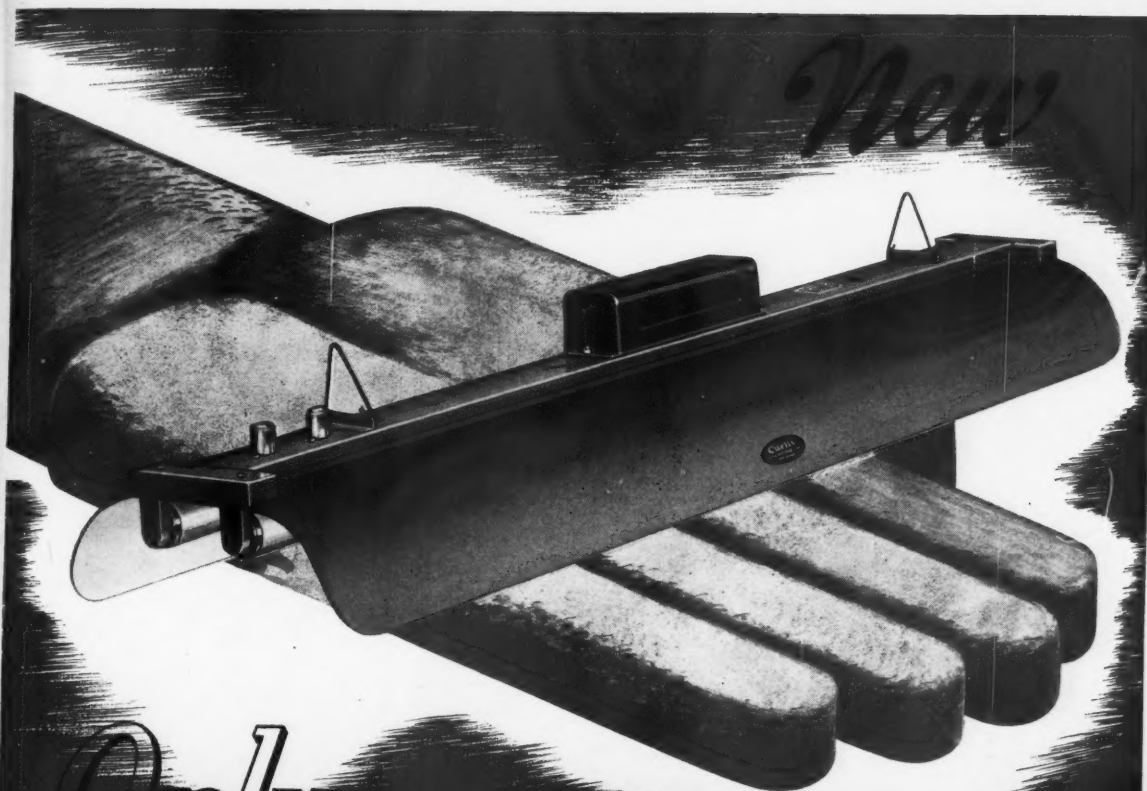


MITCHELL FLUORESCENT FIXTURE

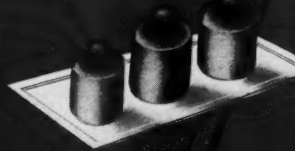


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Only



2½ POUNDS  
Of Metal in the Wireway

Well under the three-pound steel limit, the new Curt's instant lighting unit has a wiring channel weighing approximately 2½ pounds — to support fluorescent unit for two 2-watt 40-watt lamps.

The unit illustrated is Cat. No. 1-45 C, 100-watt, just add for 2-40-watt lamps. Also available in this new design are units for 2-40-watt lamps, 1 foot units for 2-100-watt lamps and units for installation in continuous lines with either 40-watt or 100-watt lamps.

To provide flexibility in tamping, the wiring channel is shaped so that it can be supported by movable clamps anywhere along the channel between the bulb and the socket.

Best of all, the new design has Curt's "Fluorite" — arc-welding reflectors with the famous high efficiency Fluorite collecting surface.

You need complete information on this new unit. Send for it direct to us, or to the Curt's representative near you.

Conforms to Latest Steel  
Limitations Order  
Compact, Simplified  
Underwriters Label  
Individual or Continuous Row Mounting  
Certified Fluor-O-Lite

**CURTIS LIGHTING, INC.**

6135 WEST 65TH STREET, CHICAGO, ILLINOIS

## A complete line of WEATHERPROOF PIGTAIL SOCKETS



No. 43310 Bakelite  
No. 43310 Mica

These sockets are made of Bakelite, Mica or Composition, for marine and industrial use. Will withstand rough usage and high temperatures. Remarkable breakage resistance.

### LEFT HAND THREAD SOCKETS and PLUGS

Left hand thread sockets and lamps to prevent the theft of lamps have proven most successful. Standard manufacturers of lamps supply them with left hand threads. We supply all types of weatherproof sockets and plugs with left hand thread. Place letter LH after Socket numbers when ordering.



No. 53310 Bakelite  
No. 43310 Bakelite

• We Also Manufacture  
A Complete Line of

BAKELITE BOXES AND COVERS

WRITE FOR CATALOG

**UNION INSULATING CO., INC.**

Factory:

Sales Office:

No. 43319 Bakelite

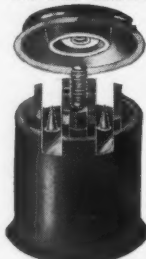
Parkersburg, W. Va.

27 Park Place, N.Y.C.

No. 1159 Mica



No. 60666 Bakelite

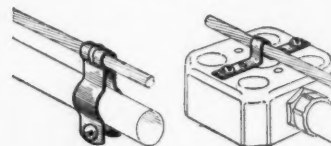


No. 43308 Bakelite



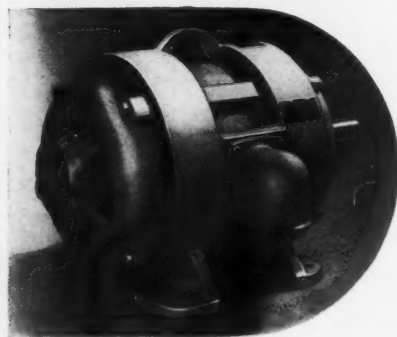
### Messenger Hanger and Strap

A new hanger and strap for the new "Messenger Cable" type of installation has been announced. In this type of installation, a stranded steel cable of  $\frac{3}{8}$ -in. diameter is strung at the desired height above the floor or work surfaces and the conduits, boxes and lighting fixtures are fastened to and supported by the messenger cable. By snapping the hanger into place over the messenger cable, the compression of the top loop of the hanger holds it in place while the conduit is put into place without dislodging the hanger. After the conduit is in place, the clamping bolts are installed and drawn up tight, gripping the conduit, preventing shifting or moving of installation under conditions of heavy vibration. The messenger strap, designed for use with the messenger hanger, fits standard outlet boxes and supports the box at the proper level to permit alignment of the conduit when the conduit is mounted in hanger. Minerallac Electric Company, 25 North Peoria Street, Chicago, Ill.



MINERALLAC HANGER AND STRAP

## BURKE Induction MOTORS



Burke Motors available in all forms and types. Multi-speed—drip and splash proof—enclosed fan cooled—vertical—flange—round frame—elevator—crane and hoist, etc. for continuous and short time duty.

Investigate Burke's line of Induction Motors for application from 1 to 1500 H.P. All welded frames, no rivets or bolts—air gap held to very close limits—all coils are form wound and treated with plastic, age-resisting composition, vacuum impregnated. Individual coils easily replaced—a modern sturdy design.

WRITE FOR  
BULLETIN 101-A

**BURKE**  
• ERIE

AC & DC GENERATORS  
AC & DC MOTORS

**ELECTRIC CO.**  
PA. U.S.A.

EXCITERS • •  
TERMINAL BLOCKS

MOTOR GENERATOR SETS

### Switch

The No. 1010 Levolver switch has been re-designed, in order to save brass. Its bakelite casing and steel lever are compact and light. The switch is rated 10 ampere, 125 volt and has a special "T" rating, showing that in addition to standard Underwriters tests, it has had 12,000 more pulls on a load cold, high wattage, type C lamp with initial amperage surge of 80 amps; eight times its rated capacity. McGill Manufacturing Company, Inc., Valparaiso, Ind.



McGILL SWITCH

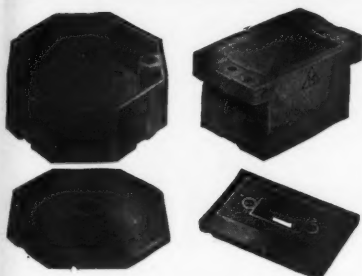
# ILLINOIS

Completely Insulated  
**ALL PORCELAIN  
WIRING SYSTEMS**

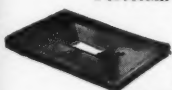
**Save Critical Materials**

**Save Installation Time**

**Cut Maintenance**



★ An ILLINOIS Porcelain System enables you to do an outstanding modern wiring job—you are afforded every advantage in making easier, safer, more convenient, and efficient layouts—you can guarantee these porcelain systems for longest service life, for safety, and for greatest all round satisfaction. Porcelain does not rust or corrode. It is a logical wiring material because it conserves steel, zinc, copper, rubber. Grounding is unnecessary when you use this system. Clamps are not required for porcelain boxes. When you sell your next wiring, sell an ALL Porcelain System.



**Bull Dog**  
REGISTERED

**ILLINOIS  
ELECTRIC PORCELAIN  
COMPANY**

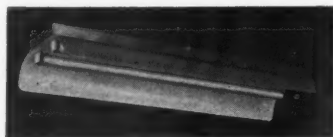
Macomb, Illinois

## EQUIPMENT *News*

[FROM PAGE 100]

### Fluorescent Units

A new series of non-metallic reflector industrial fluorescent lighting units. The reflectors are made of pressed-wood Masonite. Units can be mounted separately or in continuous lengths by means of knockouts in channel ends. They are for general illumination or for supplementary lighting over work benches and inspection tables. Fixtures are available for two, three or four 40-watt lamps and two 100-watt lamps. Ender Manufacturing Corp., 260 West Street, New York, N. Y.



ENDER FLUORESCENT UNIT.



CHICAGO CABLE CONNECTORS

### Cable Connectors

The screw and tapered sleeve construction of this new rapid cable connector makes locking positive. A three-quarter turn in opposite directions, connects or disconnects cable in less than three seconds. No tools are required. This construction assures high conductivity and eliminates possibility of shorting, fire hazards and damage to work or equipment. Connectors will handle 1, 1/0, 2/0, 3/0 and 4/0 cable and are recommended for various types of conductor cables such as on supply lines, ships, electric railways, mining operations, etc. Chicago Tool & Engineering Co., 8347 South Chicago Ave., Chicago, Ill.

## Just Published! To Help SPEED WAR WORK

Clip the coupon for your  
copy of the NEW bulletin on  
**BLACKHAWK  
HYDRAULIC  
EQUIPMENT**



**FREE**

### Get the story on these amazing Porto-Power PIPE BENDERS

They have exclusive features that put money in your pocket and rush projects way ahead of schedule. And, with your man-power and material problems—you'll be glad to know that they're ONE-MAN OPERATED and ACTUALLY SAVE MATERIALS!



### IF YOU ALREADY OWN A BLACKHAWK PIPE BENDER—

all the more reason to write for the new Bulletin. We want you to have the benefit of knowing all about the special attachments which adapt your present hydraulic unit to pulling drive pulleys, lifting heavy equipment into place and doing scores of other trouble jobs easily!



*Mail This  
Today*

BLACKHAWK MFG. CO.  
Dept. P2043, Milwaukee, Wisconsin  
Rush your new Hydraulic  
Equipment Bulletin V-43 to us.

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# P&S

(time-tested)  
**PORCELAIN**  
*Wiring*  
**DEVICES**



Just as P&S PORCELAIN WIRING DEVICES installed years ago are still serving faithfully—so new installations of these devices will serve long after this war is won.

Ask for complete information.  
Sold through Electrical Wholesalers

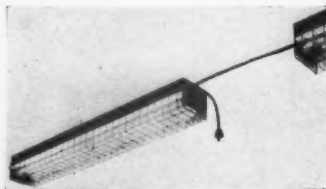
**PASS & SEYMOUR**  
INCORPORATED  
SYRACUSE, N.Y.

**EQUIPMENT** *News*

[FROM PAGE 100]

## Fluorescent Lamp

A new double-circuit mechanic's light with receptacles for plugging in small power tools and additional fixtures is announced. Four lights can be connected in line to a maximum of 60 feet from a single outlet. It was originally designed to illuminate the fuselage interiors of large aircraft during construction but the unit is being adapted to other industrial uses. The 24-in. unit contains two 20 watt lamps and the 48-in. unit has two 40 watt lamps. Both units are available for either 50 or 60 cycle current and are high power factor to eliminate flicker. Brackets for hanging and a hinged wire lamp guard are standard equipment. Lumidor Manufacturing Company 3120 East Pico Blvd., Los Angeles, Calif.



LUMIDOR MECHANIC'S LIGHT

## Inter-Communication System

The Super-Chief model has been added to this line of inter-communication systems. It features the "Conference Traffic Control". This enables any number of stations to hold a private conference without interruption or eavesdropping from other stations outside of the conference group. Other features include "Uni-Trans" or one way automatic transmission; finger-tip pushbutton control, which utilizes the "Hold-O-Matic Switch". Each station is equipped with individual volume control. It is available in systems consisting of from 2 to 10 or 20, 30, 40, 60, 80, etc. stations. Talk-A-Phone Mfg. Co., 1219 W. VanBuren Street, Chicago, Ill.



TALK-A-PHONE INTER-COMMUNICATION SYSTEM

"These are **BUSY** days!"



**SAVE TIME**—select your conductor fittings from this Catalog . . . **ALL** good types

You can buy Tee Connectors, Grounding Clamps, Cable Taps . . . Straight, Parallel, Elbow and Cross Connectors . . . Service Connectors, Bus Supports, Terminals . . . practically every good type, in the **COMPLETE** line.



**JUST FOR EXAMPLE—** here are some of the standard Penn-Union Vite terminal lugs:



2-bolt flange



45° flange



Side flange



Center tongue



Round, 45°



Round, 90°



Round, offset



Round, center

These types and many more—in a complete range of sizes. Write for Catalog.

Penn-Union connectors are the first choice of leading utilities, industrials, electrical manufacturers and contractors. They have found that "Penn-Union" on a fitting is their best guarantee of Dependability.

**PENN-UNION**  
**ELECTRIC CORPORATION**  
ERIE, PA. Sold by Leading Jobbers

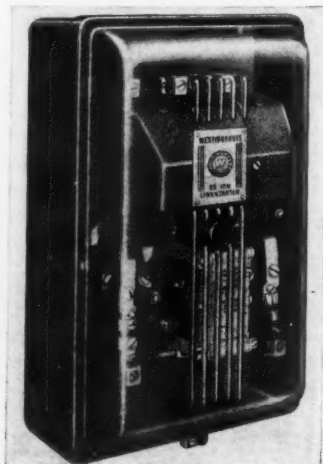
**PENN-UNION**  
Conductor Fittings

**Liquid Coating**

This new liquid coating, known as No-Spat, prevents adhesion of welding spatter. After welding the spatter may be wiped away. It is claimed that No-Spat fuses with the molten metal and maintains maximum tensile strength by floating off impurities and prevents porosity, stabilizes arc thus minimizing rod spatter and saving much rod metal. It is a rust protector, will not freeze and may be used over the full welding range of amperage and voltage. The Midland Paint & Varnish Co., Cleveland, Ohio.

**Linestarter**

A new Size 2 Class 11-200 linestarter is announced for machine tools, textile machinery, pumps, fans and similar machines. This compact linestarter is designed for group mountings, built-in applications or remote mountings and has a new clapper-type armature with knife-edge bearings. It utilizes double-break silver to silver contacts, thus eliminating shunts and reducing maintenance. Overload relays are reset either by hand or automatically. On applications requiring sequence or auxiliary interlocking, provision is made for a total of four normally open or closed electrical interlocks. All parts of the new unit are accessible from the front and all control circuit terminals and interlock terminals are marked. Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.



WESTINGHOUSE LINESTARTER

# ... SPERO

## A DEPENDABLE SOURCE For Industrial Electric Fittings and Lighting Equipment

Why waste time and lose orders by "shopping around"? Spero will back you up with prompt deliveries of quality electrical products—priced right. Spero line includes:

### SPERO NOW MAKES NAVY 9S FITTINGS

To meet the demands for 9S Series fittings for the U. S. Navy, Spero now offers a complete line of steel drawn boxes—in 3", 4" and 5" sizes, manufactured according to Navy drawings.

- Fluorescent Lighting Fixtures
- Shallow and Dome Type Reflectors
- Flood Light Fixtures and Equipment
- Vapor-proof Lighting Units
- Surface Cabinets
- Industrial Installation Equipment

*Distributed only through legitimate electrical wholesalers*

**S** THE SPERO ELECTRIC CORPORATION  
18222 LANKEN AVE. ★ CLEVELAND, OHIO

## TOMORROW-YOU CAN MOVE YOUR PIPE TO THE PARLOR...



In tomorrow's modern home even the most sensitive nostrils won't be offended when dad puts a match to his favorite brier or when mother burns the toast.

Dead air pockets in homes will be as outdated as lightning rods because the word ventilation which once meant "open the window and pray for a breeze," is today a scientific certainty.

Victor pledges that when our war job is finished, we will once again lay honest claim to our reputation as the outstanding producers of electric home ventilators.



VICTOR ELECTRIC PRODUCTS, INC.

Dept. 1B-632, 2950 Robertson Rd., Cincinnati, Ohio



*For An Air Minded Nation... Victor Ventilation!*

★  
*Demanded Wages*

*vs.*

*Earned Wages*

Every man who must manage other men and women must sooner or later face the question of what attitude to take on a wage problem.

Most management men, today firmly believe that the higher the standard of living, the greater the opportunities for themselves and their business.

However, few people realize the difference between a true increase in living standards and a flat demand for higher wages.

The management man is often forced to resist a wage increase which he knows will handicap his plant, or his entire industry, and therefore, its ability to provide employment.

In meeting demands for wage increases which are not justified by more efficient operation, management seldom has the opportunity to defend its attitude toward real wages, based upon increased efficiency. If management does attempt an explanation, its arguments are often discounted.

To help give both public and government a clearer understanding of the difference between a demanded wage and an earned wage, McGraw-Hill has published the advertisement reproduced here, in Washington, New York and Chicago newspapers.

I hope you will read this entire newspaper advertisement carefully. Then, I will appreciate it if you will write me and let me have your comments. If you want reprints for your friends, I'll be glad to see that they are supplied.

*James H. McGraw, Jr.*  
President

McGraw-Hill Publishing Company, Inc.



*Where do*  
**WAGE INCREASES**  
*come from?*

In these days, when words like "economics" and "collective bargaining" help to obscure plain thinking on such old-fashioned problems as *earning a living* and *asking for a raise*, it is sometimes hard to remember that, underneath the chromium plate of words, things work out pretty much the same as they always have.

In the old days, every plant and mine was on its own. Economics was visible to the naked eye. You kept your costs in line with competition, or you took immediate consequences in reduced sales and employment. Today, if wages are increased through national wage agreements, costs go up in an entire industry.

► To many people that seems an improvement on the old-fashioned way, and few stop to ask where the catch is.

The simple fact is that new words cannot repeal arithmetic. National wage increases, like local wage increases, must be paid for either through higher prices or through lower costs, resulting from better equipment and more efficient methods.

Waiting down the road for the higher-priced industry is the same fellow who used to keep the single plants in line . . . THE BUYER.

This advertisement is available in handy booklet form. (Less than 100 copies free. Larger quantities, \$1.50 per 100; \$10.00 per 1000).



## Where do wage increases come from? (cont'd)

The consumer always corrects high prices in the long run. Just as the high-priced individual plant lost business in simpler days, so the high-priced industry loses business today.

If coal, for instance, gets too high-priced in war, buyers will turn to other sources of heat and energy when they have the opportunity.

► This will happen in the case of a customer here and a customer there, but the total will pile up until the miners find themselves with high hourly wages, but without enough market for their product to keep them steadily employed.

This has happened before, where men have tried to lift themselves by a strong pull on their political bootstraps.

### How can people live better?

It ought to be clear to Americans, of all people on earth, that better living comes only through doing things better.

It does no good to have more dollars in the pay envelope, if those dollars are going to raise prices. Higher prices make buyers look for a substitute for the things you produce. If the things you make don't sell, you live poorer, no matter what your hourly rate of pay.

That made sense when we were a little country. Doesn't it still make sense?

► Let's take coal, again, as an example. People can pay more for coal (thus allowing more for real wages) every time somebody invents a way to make each ton of coal produce more heat. The energy is in the coal. All we need for better living for coal miners is constant improvement in machines for getting heat out of coal.

—OR, miners can earn higher wages at the same price for coal every time somebody invents a machine for getting out more coal per miner.

Those two things—a better product, or the same product for less money—have been the secret of our better living. They always will be the secret. Any wages that are increased without them are a burden on every buyer.

In mining, as in all industry, the only way to get better living is to continue to use the old-fashioned recipe that has made America great.

Here is the recipe for better living, in mining and in all industry:

1. Constantly improve the equipment available for the worker.
2. Use the lowered costs thus produced to
  - (a) lower prices to consumers
  - (b) raise wages
  - (c) provide incentives for invention, leadership and investment
  - (d) lay aside "Seed Money" that can be used to start over again at item 1.

### "Seed-Money" produces better living

America has always been an inventor nation. Throughout the years, most of the profits of business have been used to buy inventions . . . better machines, more efficient factories, research for better products. We call profit that is "plowed back" into business "Seed Money." Through Seed Money, products are constantly improved, making possible lower prices and higher wages.

Did you know that this process of putting aside Seed Money has been almost entirely eliminated by our tax law?

► Congress, in properly shutting the door on wartime profiteers, wrote the Excess Profits Law in such a manner that it also takes away most of the Seed Money of business.

Industry must have Seed Money to continue the work of making better products available at lower costs, to create more jobs and pay higher real wages. The Excess Profits Law must be changed if we are to provide Seed Money for making post-war jobs. If you think so, too, ask your Congressman to review this law and all laws—with this principle in mind:

*"Industrial Progress is the Basis of all Good Living".*

#### THE MCGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

22 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

#### MCGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

## MCGRAW-HILL

PUBLISHING COMPANY, INC. . . . BOOK COMPANY, INC.:

330 WEST 42ND STREET, NEW YORK

#### THE MCGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION:

American Machinist • Aviation • Bus Transportation • Business Week • Coal Age • Chemical & Metallurgical Engineering • Construction Methods • Electrical Contracting • Electrical Merchandising • Electrical West • Electrical World • Electronics • Engineering & Mining Journal • E. & M. J. Metal and Mineral Markets • Engineering News-Record • Factory Management & Maintenance • Food Industries • Mill Supplies • Power • Product Engineering • Textile World • Wholesaler's Salesman • Affiliated with Business Publishers International Corporation, publishers of Business and Technical Magazines for Latin America, and Overseas Circulation.

# BUILT FOR THE AIR SERVICE



W. L. B-2A Relay is rated 25 A. at 24 V. single pole, single throw, normally open contacts.

When Ward Leonard developed their B-2A Relay to meet the Army Air Corps tests for vibration and acceleration, they went further than required. They incorporated features in it not found in any other relay.

Yes, this relay is used on aircraft, but the very features that make it desirable for airplane use make it equally desirable for any purpose when a rugged, positive, crisp acting relay is required. Send for bulletin.

## WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control (WL) devices since 1892.

WARD LEONARD ELECTRIC CO., 28 SOUTH ST., MOUNT VERNON, N. Y.



PATENTS and PATENTS PEND.

## PIPE BENDER

for steel pipe and conduit from 3/8" to 4 1/2"

- NO HEATING
- NO FILLING
- NO KINKS
- NO WRINKLES

Make your offsets and bends up to 90° (and more) in one single, simple operation in a few minutes.

The pipe is NOT MOVED during the bending thus avoiding kinks and wrinkles. All bends—one or 1000 all identical and perfectly uniform even if made by "green hands."

Quick changeover to various sizes. Few seconds to mount and dismount. FASTEST PORTABLE BENDER!

SMOOTHNESS OF BENDS:

No wrinkles—no kinks—no breaking of pipe due to scientific development of bending formers. No job too complicated.

Obtainable in three different sizes Meets U. S. Navy, Army & Maritime Comm. Specifications Write today for circular giving complete description

**TAL'S PRESTAL BENDER, INC.**

Dept. E4

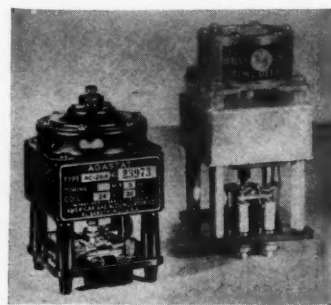
Milwaukee, Wisconsin



[FROM PAGE 103]

## Relay

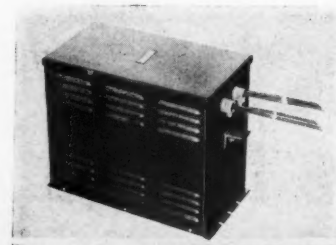
The Agastat, electro pneumatic time delay for making or breaking electrical circuits at pre-determined intervals, has been re-designed. By a screw adjustment, it permits a delay ranging from a fraction of a second to several minutes. The basic design and principle of operation have been adhered to. It is the diaphragm type timing device. It is unaffected by heat, cold or variations in operating voltage, temperature or humidity. The improved Agastat is lighter in weight and smaller in size. Housing and component parts of heavy brass and other critical materials now have substitutions in all but the actual operating mechanism. American Gas Accumulator Company, Elizabeth, N. J.



AMERICAN GAS RELAY

## Stabilizer

This new voltage stabilizer provides a constant output of 115 volts from circuits varying between 95 and 130 volts. It is insensitive to load power factor and is not affected by variations in load from no load to full load or by changes in power factor from unity to 0.8 lagging. It is self-protecting and will operate continuously throughout the range from open circuit to short circuit without damage. The stabilizer can be applied wherever close voltage regulation is requisite to good operation. Ratings from 50 va. to 5000 va. are available. General Electric Co., Schenectady, N. Y.



G-E STABILIZER



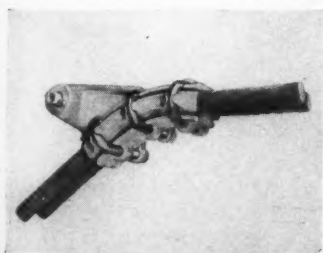
BENJAMIN PROJECTOR

### Floodlighting Projectors

The new Type RDS floodlighting projector is for protective floodlighting and lighting of yards, arcways and other outdoor work places. It replaces Type RD and embodies all features of the previous model with the exception that all parts formerly made of aluminum, brass or other non-ferrous metals are now furnished in steel or cast-iron specially treated by porcelain enameling and other rust-proofing to make them resistant to corrosive atmospheric influences and weathering. The new units are furnished in two models. The RDS 14 is for 300 watt and 500 watt general service lamps or 500 watt floodlighting lamps. The RDS 18 is for 750 watt and 1000 watt general service lamps or 1000 watt floodlighting lamps. Each model is supplied with plain, stippled or ribbed, heat resisting glass covers. Benjamin Electric Mfg. Co., Des Plaines, Ill.

### Connectors

This cable strain connector is for use on defense projects where multiple cables are being substituted for copper tubing or rolled sections to conserve copper. The illustration shows type "SUD" strain connector to take two 1,000,000 CM cables in parallel. Fittings are available for multiples of two or four cables in all cable sizes up to 1,000,000 CM. Delta-Star Electric Company, 2400 Block Fulton Street, Chicago, Ill.



DELTA-STAR CONNECTOR

# "Skilled" Lighting

FOLLOWS THROUGH  
with  
RLM Non-Metallic  
Reflectors!



ADAPTABLE  
SUSPENSION

"C-clamp"  
slide hanger  
with  
cable clamp

"C-clamp"  
slide hanger  
for  
conduit  
mounting

"C-clamp"  
slide hanger  
for  
close-to-ceiling  
mounting

Reflecting surfaces of chip-proof, washable baked enamel have an enduring reflection factor of not less than 84% . . . minimum overall efficiency of 80% in 48" 2-lamp units, 73% in 3-lamp units and 73% in 60" 2-lamp units.

With metal at a premium . . . you can still have the advantages of "Skilled Lighting"! Wheeler engineers . . . lighting specialists with over 61 years' experience . . . have developed fixtures with non-metallic reflectors that meet all requirements of wartime industry for efficient fluorescent lighting.

Wheeler "War-Aid" Reflectors fulfill high standards of construction as well as illumination. Non-flammable, moisture-resistant,

rugged . . . equipped with special features that simplify installation and maintenance. In every way now practical, they're typical Wheeler "Skilled Lighting!"

Write for new bulletin No. 71 on Wheeler "War-Aid" Fixtures and catalog of Wheeler Incandescent Fixtures. Wheeler Reflector Company, 275 Congress St., Boston, Massachusetts . . . New York . . . Cleveland. Representatives in principal cities.

Distributed Exclusively Through Electrical Wholesalers

**Wheeler** REFLECTOR  
COMPANY

Lighting Equipment Specialists Since 1881





## LOOK TO WALKER for LEAD COVERED CABLE

Today there is an ever increasing demand for lead covered cable. In defense plants—at air fields and supply bases—for ships in the maritime service—and in the manufacture of the materiel supplied to our fighting forces!

Our lead press equipment is running day and night to help supply these needs. Walker Brothers, Conshohocken, Pa.

### Walker Lead Covered Cable

Furnished in Solid Conductor from 18 gauge to 4 gauge and in Stranded Conductor from 14 gauge to 500,000 circular mils., with 1, 2, 3 and 4 conductors. Shipped on standard length reels of 500 feet minimum.

# WALKER & Conshohocken

### Manufacturers of:

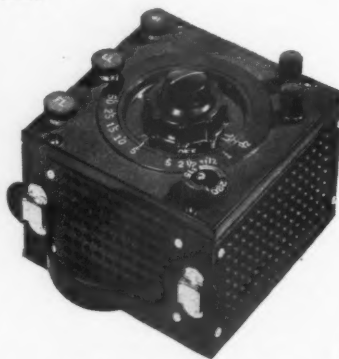
UNDERFLOOR DISTRIBUTION SYSTEMS;  
RIGID STEEL, FLEXIBLE AND THIN-WALL  
CONDUITS; RUBBER, RUBBER AND LEAD,  
SYNTHETIC WIRES AND CABLES; SERVICE  
ENTRANCE AND NON-METALLIC CABLES

EQUIPMENT *News*

[FROM PAGE 107]

### Testing Equipment

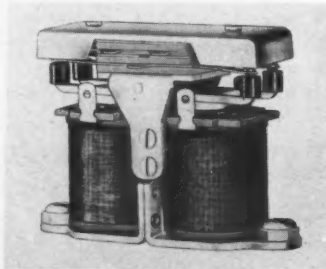
The FL-LL switch which has been built into the rotating current control switch makes it a simple matter to shift from light to full load and vice versa, without disturbing the current setting. Also, the three secondary binding posts built on the Type FLD load permit connections to the FL and LL posts of the rotating standard, thus minimizing the need of lead changes during test. When the rotary switch is set up for the full load value desired, the 10 percent LL setting is made automatically. The States Company, Hartford, Conn.



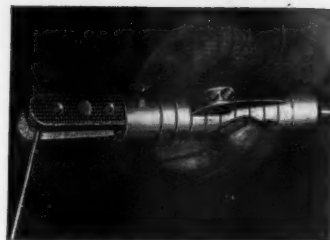
STATES TESTING EQUIPMENT

### Relay

This relay is a double action interlocking control unit with balanced armature control. It can be made to fit into designs where its light weight and small size are essential. Relay is available in various contact arrangements or with Micro switches in place of spring pile-ups. Capacities up to five amperes, 110 volts a.c. rating; coil capacity 10,000 ohms each; contact forms or assemblies up to 12 springs on each side. It occupies a space of 2½-in. long by 1-13-in. high by ¾-in. deep. Cook Electric Company, 2700 Southport Avenue, Chicago, Ill.



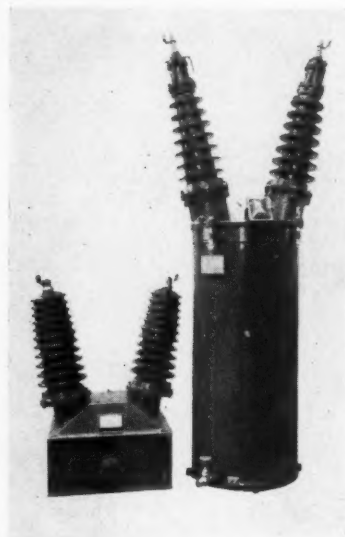
COOK DOUBLE ARMATURE RELAY



JACKSON ELECTRODE HOLDER

### Electrode Holder

This arc welding electrode holder is designed especially for welding operations in the electrical field. The holder, Model F-1, is made of special high conductivity copper alloy, has a rated capacity of 200 amperes, takes rods from the smallest up to ⅝-in., has an overall length of 7-¾-in., and has mechanical or solder cable connection. Insulated, it protects the welder's eyes against flash. Its light weight enables the welder to manipulate it easily in tight places. Jackson Products, Detroit, Mich.



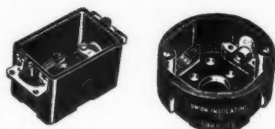
G-E TRANSFORMERS

### Transformers

A new line of two-bushing outdoor potential transformers, Type E-236, rated 24 to 69 kv., 50/60 cycles, has been announced. The height of the new transformers, which supersede the Type E-116, has been reduced 15 to 50 percent, weight has been reduced 10 to 60 percent and liquid volume, 45 to 90 percent, depending on the rating. Transformers can be mounted up in the substation structure with the small size G-E current and single-bushing transformers. They have no gaskets; are hermetically sealed by means of sealed bushings, all-welded steel tank and sealed-in-glass secondary terminals. They can be supplied filled with either Pyranol or oil. General Electric Co., Schenectady, N. Y.

## Outlet Boxes

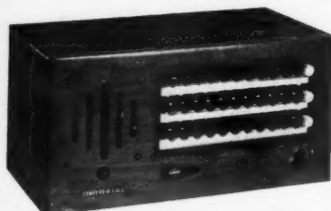
A line of Bakelite outlet boxes and covers for either surface or concealed wiring. They can be used with non-metallic sheath and CNX type of cable. Boxes are corrosion and moisture resistant. No grounding is necessary. The sizes and design, except for clamps and wire knockout, are the same as standard metal outlet boxes. They take standard type of fixture studs. These boxes have side knockouts and clamps to take 14-2, 14-3 and 12-2, non-metallic sheathed cable, and 14-2, 14-3, 12-2 and 12-3 CNX type cable and one ½-in. bottom knockout. Union Insulating Co., 27 Park Place, New York, N. Y.



UNION OUTLET BOXES

## Inter-Communication System

The new President's model Convers-O-Call provides a combination all-master system of factory and office inter-communication. You can page an entire factory or communicate privately with one or more departments. Calls go through even if the power of the station you call is turned off. System can be utilized for music transmission to employees. It is available for 10 to 30 stations. It takes the strain off telephone switchboard. Fred E. Garner Co., 53 East Ohio St., Chicago, Ill.



GARNER INTER-COMMUNICATION SYSTEM

## Extension Light

This new extension light is safe against electric shock even when the guard is removed. The light has a guard of heavy fibre and a new type of spring contact. It is so designed that the guard serves as the on-and-off switch. When it is unscrewed the current is automatically cut off. The entire device is made of non-conductive materials, removing the hazard of electrical shock to persons and the danger of short circuits. Bulbs are replaced quickly since the guard is removed without the use of tools. Davis Emergency Equipment Company, 45 Halleck Street, Newark, N. J.



DAVIS SAFETY EXTENSION LIGHT

# GREENLEE TOOLS TO HELP THE ELECTRICIAN GET MORE WORK DONE

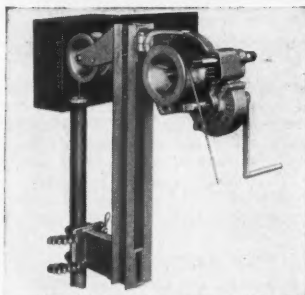
As good man power becomes scarcer in the present emergency, increase the efficiency of your men by turning to a better use of tools. Let Greenlee Tools help you speed up construction by making the work easier and faster for the man on the job. Greenlee Tools are daily saving contractors from 15 to 75% in time and labor costs.

## COMPLETE LINE OF BENDERS

Whatever you have to bend... tubing, conduit, pipe, or bus-bars... there is a Greenlee Bender to do the job easier and faster. Small hand benders for copper, brass, and aluminum tubing, and powerful hydraulic benders for 1¼ to 4½-inch conduit and pipe. Benders that are easily operated by one man, save the cost of many manufactured bends and fittings, are compactly built in one unit, and are easily carried to the job and set up. Find out how Greenlee Benders can save you hours on your bending work... write for Bender Booklet S-116.

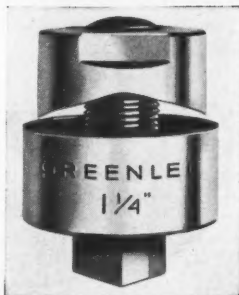


## NO. 765 CABLE PULLER

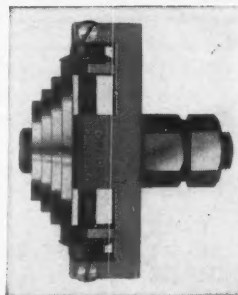


Here's a handy tool to make the tough job of cable pulling easy for the electrician. This Greenlee Cable Puller clamps right on to the conduit through which cable is pulled. It has the power to pull from any and all conduit, through long or short runs, through straight or bend conduit, and through open or covered conduit. It is easily carried to the job, can be set up in a jiffy, and is easy for one man to operate with one or two cranks, and will save many hours of work when pulling in cable. For more details send for Cable Puller Folder S-115.

## GREENLEE KNOCKOUT TOOLS



Greenlee Knockout Punches and Cutters will enlarge holes in metal up to ⅝-inch thick without long tedious drilling and filing. A Knockout Cutter or Punch is inserted in a knockout or a small drilled hole, a few turns of the drive nut with an ordinary wrench, and a hole up to 3½ inches can be cut in 1½ minutes or less. Write for Knockout Tool Folder S-114.



# GREENLEE TOOL CO.

1744 COLUMBIA AVE.

ROCKFORD, ILLINOIS

TOOLS TO MAKE THE ELECTRICIAN'S JOB EASIER

# Keep Up-to-Date on new developments

through this **FREE SERVICE** . . . . .

Electrical Contracting brings you the latest literature of leading manufacturers without cost or obligation.

## VOLTAGE STABILIZER

**1** Folder GEA-3634 illustrates and describes the new automatic voltage stabilizer, which gives constant output voltage with variable input voltage. General Electric Company

## INSTRUMENTS

**2** Bulletin 1730 features the U.S.-made "Megger" instruments for testing electrical insulation resistance. They are of the hand-generator and direct-reading ohmmeter type. James G. Biddle Co.

## PRESSURE TERMINALS

**3** Bulletin No. 500 gives details on the entire line of Sta-Kon terminals made for each wire size from No. 22 to 250 MCM commercial AWG. It consists of 44 pages. The Thomas & Betts Co.

## AUTOMATIC CONTROL EQUIPMENT

**4** Bulletin No. 720 features details of construction, latest improvements, applications and prices on magnetic contactors, reversing controls, automatic reset timers, process timers, program clocks, remote control switches and automatic transfer switches. Zenith Electric Company

## SWITCHES

**5** Publication No. 4301 describes and lists multiple finger, single and double throw, outdoor form disconnect switches, in capacities up to and including 1200 amperes, and voltage ratings up to and including 69 kv. Delta-Star Electric Company

## MOTORS

**6** Bulletin 120 on aircraft motors consists of 28 pages of data on standard and special aeromotors ranging from 1/50 to 1/4 hp. Photographs, dimensional drawings, specifications and ratings as well as full description of the motors' application and performance is given. The Dumore Company

## INSULATORS AND FITTINGS

**7** A new Pinco catalog, consisting of 12 pages covering all standard insulators and fittings. It includes a bare wire table for all types, giving wire sizes, number of wires in strand, diameter in inches, weight in pounds per thousand feet and breaking strength. The Porcelain Insulator Corporation

## FLUORESCENT MAINTENANCE

**8** A 20-page booklet entitled "Timely Wartime Tips on Fluor-

escent Maintenance". It covers the maintenance program; how to test and when to replace equipment; factors that affect performance and life. Sylvania Electric Products, Inc.

## CRITICAL MATERIALS

**9** A new 96-page booklet, B-3206, is entitled "Wartime Conservation" and contains recommendations for selecting, applying and using electrical equipment so as to achieve the best possible output with the greatest saving in critical materials. It covers up-rating of motors, thermal temperature loading of transformers, industrial network systems, line equipment and materials. Westinghouse Electric & Mfg. Co.

## ENCLOSED BUSBAR

**10** Bulletin No. 427, 76 pages, is a handbook on the enclosed busbar method of electrical distribution for industrial plants and commercial buildings. There are sections on LO-X feeder type bus duct; plug-in type bus duct for branch circuits and dimensional data and useful information. Bull Dog Electric Products Co.

## TRANSFORMERS

**11** Bulletin B-6186 illustrates and describes power and distribution transformers. The new electro-cooler for increasing transformer capacity, and unit substations which simplify power control and distribution are two new developments. Allis-Chalmers Manufacturing Co.

## LIGHTING HANDBOOK

**12** A new Government manual and price schedule on Birdseye lamps and lighting. It is designed to present the essential facts of productive wartime lighting. Available only to Government procurement agencies, purchasing personnel and Government engineers. Birdseye Electric Corporation

## SWITCHGEAR

**13** Booklet GEA-3898 features switchgear for mercury-arc rectifier equipment. It also shows circuit sketch of rectifier and switchgear equipments in an industrial plant. General Electric Co.

(Continued on page 112)

Circle numbers, sign and paste on your letterhead and mail in an envelope.

### ELECTRICAL CONTRACTING

300 West 42nd St.  
New York, N. Y.

April

(Not good after June 1)

Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30  
31 32

NAME . . . . . TITLE . . . . .

COMPANY . . . . .

ADDRESS . . . . .

CITY . . . . . STATE . . . . .



# more juice to old friends



**W**E can't get around to see you these days as often as we'd like, because of the manpower shortage. But we do want very much to keep in touch with you. One way we can do this is through **MORE JUICE**.

Maybe you are already on the free mailing list of this pocket size monthly, and get a mild kick out of it, along with a fresh idea now and then.

On the other hand, if you fill out the coupon at the bottom of the page, here's what you are letting yourself in for:

An unpretentious little publication with no product advertising, and a minimum of tripe. It kicks off regularly with some burning question that burns us up. You too, probably.

There's good-natured kidding between Reddy, whose ugly young mug is shown above, and the Vice-President in charge

of Service, and of Sales—when we are free to make them! In the Give and Take Dept. readers can air a peeve or share a swell idea. A cartoon, known as Passing Smiles, is enclosed with each issue.

It aims to keep out of your waste basket for the five or seven minutes it takes to read.

About 15,000 fellows in Electrical Wholesaling and in industry generally, get it regularly—at home or in the Service. To start with the next issue, mail the coupon today.

**MORE JUICE** has never been advertised before. Frankly the only reason we're doing it now is to keep up with old friends.



**ORDER  
YOUR ELECTRICAL  
REQUIREMENTS  
at least 4 MONTHS  
AHEAD!**

**THE THOMAS & BETTS CO.**  
INCORPORATED  
MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899  
ELIZABETH, NEW JERSEY  
In Canada: Thomas & Betts Ltd. Montreal

Shall we shake hands on this?

Reddy Fitter  
c/o Thomas & Betts Co.  
Elizabeth, New Jersey

Please put me on the complimentary mailing list for **MORE JUICE**.

Name.....  
(Nick name, if you like)

Address.....  
(Home, if you like)

Company.....

## need PLUGS and RECEPTACLES?

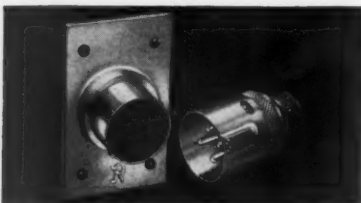
Pyle-National plug and receptacle equipment offers a wide selection of styles, sizes, and ratings for use with all types of portable equipment, signal and control circuits, pyrometers, extension lights, high frequency tools, welders, battery chargers, and similar equipment. Write for Pyle Catalog 1100 with complete listings.



**General Purpose** plugs and receptacles: 1, 2, 3, 4, 5 poles; ratings 30, 60, 100, 200 amperes. Round prong contacts, rugged cast metal housings to withstand severe service.



**QuelArc** circuit breaking types: 2, 3, 4 wire types, ratings up to 200 amperes. Exceptional protection to contacts, for safe use as current rupturing devices.



**Triploc and Multiple Circuit** plugs and receptacles: 1, 2, 3, 4, 6, and 8 pole contact units, allowing assembly in combinations up to 32 poles. Manual and automatic release features. Ideal for portable tools, pyrometers, signal and control circuits.



**Midget Triploc**, compact, but with many exclusive heavy duty features for dependable service under severe conditions: 2, 3, 4 pole types.

Write for your copy of Pyle Catalog 1100 with complete listings of all types.

**The Pyle-National Company**  
1344 N. Kostner Ave. • Chicago, Ill.

## New Literature

[FROM PAGE 110]

### CONNECTORS

**14** A folder illustrating and describing pressure connectors for maintenance and repair problems. The Thomas & Betts Co., Inc.

### WELDING AND BRAZING

**15** A booklet consisting of 100 pages of data on welding and brazing Alcoa aluminum. Many illustrations and tables are included. Aluminum Company of America

### INSTRUMENT

**16** A folder describing and illustrating the Junior multimeter, the industrial analyzer and insulation and breakdown tester. Superior Instruments Company

### MOTOR RECORD CARD

**17** A motor record card (GES-1526A), size 4- by 6-in., containing spaces on both sides for the recording of essential information on each motor as well as nature and extent of inspections and repairs, is available to maintenance engineers. General Electric Co.

### FIBRE CONDUIT

**18** An eight page folder describing and showing installations of Orangeburg fibre conduit, and pipe. The Fibre Conduit Company

### TRANSFORMERS

**19** Bulletin 159 lists standard specifications and mounting means of audio; driver; and interstage transformers; reactors; microphone input transformers for airborne equipment and transmitter transformers and reactors for mobile equipment. The Acme Electric & Mfg. Co.

### MOTOR CONTROL

**20** Bulletin GES-1742D, 12 pages, explains the primary and additional functions performed by the various G-E synchronous-motor controls. General Electric Co.

### ELECTRIC TOOLS

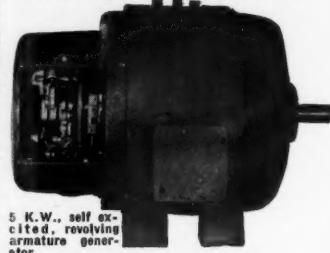
**21** A new booklet entitled "They Used Their Heads" and dealing with the adaptation of portable electric tools to war production emergencies. The Black & Decker Mfg. Co.

### WIRING SYSTEM

**22** A new bulletin describing and illustrating industrial application of Wiremold No. 3000 System Wiring. It also covers applications and installation of Plugmold. The Wiremold Company

## KATOLIGHT A. C. and D. C. GENERATORS

350 through 15,000 Watts



5 K.W., self-excited, revolving armature generator.

## DEPENDABLE— ECONOMICAL— STURDY—

We make a complete line of revolving armature generators—self-excited and separately excited models 1800 and 1200 r. p. m. Single or two bearing design for coupling drive or direct mounting. Standard voltages available: 110, 220, single phase, 2 or 3 wire, three phase or three phase four wire. Frequencies 25, 30, and 50 cycle. Voltage regulation about 8% between no load and full load with 3% speed change.

Also D. C. generators, frequency changers, rotary converters, and complete light and power plants—

**KATO ENGINEERING CO.**  
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## TIME DELAY RELAYS

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Time Delay Relay

Used to accurately delay the closing or opening of an electrical circuit following a power failure or disconnect of the A. C. operating potential. Or to provide an adjustable time delay between the closing of a pilot circuit and the subsequent closing or opening of the Timer load circuit. Powered by self-starting industrial type synchronous motors.

Hundreds of applications. Each unit precision built—rugged and dependable. Write for complete catalog of time control instruments today.

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**Paragon Chicago**

BUILDERS OF ELECTRICAL EQUIPMENT SINCE 1905

Electrical Contracting, April 1943

## ELECTRONIC TUBES

**23** A quick-selection chart of electronic tubes for industrial uses. Also a list of data sheets on electronics that are available. General Electric Co.

## SOCKETS AND LIGHTING UNITS

**24** Catalog No. 101 illustrates and describes Swivelier sockets and directive lighting units. It shows construction details and some of the applications. Reliance Devices Company, Inc.

## TERMINALS

**25** A handbook featuring the Station-Kon line of pressure solderless terminals and tools. The Thomas & Betts Co.

## CIRCUIT BREAKERS

**26** Booklet DD-29-060, consisting of 40 pages, describing the complete line of Nofuze "De-ion" circuit breakers for lighting, distribution and power circuits up to 600 amperes. Westinghouse Electric & Manufacturing Co.

## INSTRUMENTS

**27** Bulletin No. 440, consisting of eight pages, illustrates and describes the Model C-2 megohmmeter. Herman H. Sticht Company, Inc.

## ELECTRONICS

**28** A 32 page booklet entitled "Electronics — A New Science for a New World". Many illustrations are shown. General Electric Co.

## FLUORESCENT UNITS

**29** A folder illustrating and describing the new Ender series of non-metallic reflector industrial fluorescent lighting units. Ender Manufacturing Corp.

## TIMERS

**30** Bulletin 3000 features the synchronous motor driven multi contact timer. It is for sequence operations of solenoids, valves, motors, machine tools, signaling systems, heating and ventilating systems. The R. W. Cramer Company, Inc.

## MOTOR CONTROL

**31** A 16-page manual (GEA-4015) entitled "Simplified Guide to the Selection and Application of Commonly Used Motor Controls." Many illustrations and explanatory diagrams are shown. General Electric Company.

## CONNECTORS

**32** Bulletin AC-4 illustrates and describes the new Rapid Cable Connector. It also gives prices. Chicago Tool & Engineering Co.

# Latrobe PRODUCTS

★ FLOOR BOXES ★ WIRING SPECIALTIES ★

HIGH  
QUALITY

TIME SAVED

EASILY  
INSTALLED

## IN INSTALLATION SPEEDS WAR PRODUCTION

Latrobe products may be easily and quickly installed. Highly important now when every man-hour saved counts in the nation's fight for production supremacy. Highly important also is the unfailing dependability of Latrobe products for all industrial, commercial, and residential jobs



No. 400



No. 401



No. 402



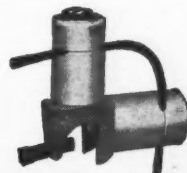
No. 403

### "Bull Dog" Insulator Supports

Malleable iron clamps of high tensile strength for fastening porcelain or glass insulators to exposed steel framework when wiring mills, plants, subways, bridges, etc. Four sizes. Quickly attached without weakening steel work.



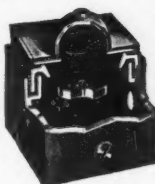
No. 3 1/2 B. & D. Cleat attached to No. 403 Insulator Support with No. 445 Cleat attachment.



Two No. 5 1/2 Split Insulators attached to No. 400 "Bull Dog" Support with 2" No. 10-24 Machine Screws.



2 1/2-in. Conduit attached to No. 403 Insulator Support with No. 466 Pipe Hanger.



No. 251-R "Latrobe" Adjustable Gang Floor Box with No. 207 Nozzle 2-3-4-gang types.



No. 140 "Latrobe" Adjustable Watertight Floor Box with No. 206 Nozzle. For use in fire-proof floors with wood floor finish.

FOR BEST RESULTS  
STOCK LATROBE PRODUCTS  
SELL LATROBE PRODUCTS

DURABLE



ECONOMICAL

FULLMAN MANUFACTURING CO.  
LATROBE . . . PENNSYLVANIA



# In the News

## CODE CHANGES

At the fifth meeting of the Emergency Committee of the Electrical Committee the following Code changes were made.

**INTERIM AMENDMENT NO. 72.** Section 4322, 1940 National Electrical Code. Approved September 10, 1942, Revised February 10, 1943.

Revise paragraph a of Interim Amendment No. 72 to read:

4322. Continuous Duty Motor. A continuous duty motor shall be protected against overcurrent as follows:

a. More than one horsepower. A continuous duty motor rated more than one horsepower shall have running over-current protection not greater than 125 percent of the full-load current rating of the motor, except that a 40 degree open-type, alternating-current motor may have over-current protection not greater than 135 percent of the full-load current rating of the motor. This protection may be secured by either of the following means:

1. A separate over-current device which is responsive to the motor current.

2. A protective device integral with the motor, which shall be responsive to motor current or both to motor current and temperature. This device must be approved for use with the motor which it protects; it must prevent overheating both of the motor and of conductors to it of sizes specified in section 4312 due to motor overload or failure to start; and it must disconnect the motor from the line under prolonged over-current equal to 125 percent of the full-load current rating of the motor in an ambient temperature of 40 C [except as provided in paragraph a above]. If the motor-current interrupting device is separate from the motor and actuated by a protective device integral with the motor, it must be so arranged that opening its control circuit will disconnect the motor from the line. The protective device together with any associated equipment shall conform to the provisions of sections 4327 and 4328.

The present fine-print note to be continued and paragraph b remain as in original Interim Amendment No. 72.

**INTERIM AMENDMENT NO. 80.** Section 4312, 1940 National Electrical Code. Approved February 10, 1943.

Delete from the table in section 4312 of the 1940 National Electrical Code references to "shop cranes" and to "hoists".

**INTERIM AMENDMENT NO. 61.** Section 6112.

Interim Amendment No. 61, to section 6112,

approved July 11, 1942, included a table of current-carrying capacities for conductors supplying cranes and hoists. This table included conductor sizes from No. 16 to No. 4/0. A demand appeared for similar current-carrying capacities for conductor sizes larger than No. 4/0, and Interim Amendment No. 61 was revised as follows:

Interim Amendment No. 61, Section 6112, 1940 National Electrical Code. Approved July 11, 1942. Revised February 10, 1943.

Add to the table of paragraph a the following:

Size	For Motors	For Motors
	Having 30 and 60	Having 5 and 15
AWG	Minute Short-time	Minute Short-time
MCM	Ratings	Ratings
250	350	385
300	410	450
350	460	510
400	515	570
450	565	620
500	620	680

**INTERIM AMENDMENT NO. 46.** Section 3005, 1940 National Electrical Code. Approved May 7, 1942. Revised February 10, 1943.

Amend the first paragraph of the fine-print note of the amendment, which appears on page 105 of the supplement to the 1940 National Electrical Code, to read:

For the duration of the war emergency conductors having 90 percent unmlled grainless rubber insulation (Type RU); flame-retardant, moisture-resistant, solid synthetic insulation (Type SN); moisture-resistant rubber insulation (Type RW); and varnished-cambic insulation (Type V); may be used wherever Types R, RP, and RH rubber-insulated conductors are acceptable.

**INTERIM AMENDMENT NO. 81.** Section 2592, 1940 National Electrical Code. Approved February 10, 1943.

Amend first four sentences of section 2592 to read:

2592 Installation. A grounding conductor, No. 4 or larger, may be attached to the surface on which it is carried without the use of knobs, tubes, or insulators. It need not have protection unless exposed to severe mechanical injury. A No. 8 grounding conductor, which is free from exposure to mechanical injury, may be run along the surface of the building construction without metal covering or protection, if it is rigidly stapled to the construction; otherwise, it shall be in conduit, electrical metallic tubing or cable armor. Grounding conductors smaller than No. 8 shall be in conduit, electrical metallic tubing, or cable armor.

Allowable Current-Carrying Capacities of Conductors with Certain Insulations.

It was called to the attention of the committee that the carrying capacity of Type EI conductors and of Types EG, WP and SBW conductors in raceways or cables, as recognized by Interim Amendments Nos. 44 and 69, had not heretofore been specified.

**INTERIM AMENDMENT NO. 82.** Tables 1 and 2. Approved February 10, 1943.

Amend Table 1 by revising the heading of the third column to read: "Synthetic Type SN, Type RU, Rubber Type RPT, Type RP, Emergency Insulation Type EI."

Amend Table 2 by revising the heading of the third column to read: "Rubber Type RP, Emergency Insulation Type EI."

Add a note to Table 1 to read:

Conductors with Types EG, WP or SBW insulation, when used as the grounded conductor of a circuit, shall conform to note 7 of Tables 1 and 2, and shall have a carrying-capacity not greater than that of the associated ungrounded conductors of the circuit.

Allowable Current-Carrying Capacities of Types SB and SBW for Open Wiring.

A request from the War Production Board that the carrying capacity of Types SB and SBW, when run open, be the same as the newly recognized carrying capacities of Type WP conductors, resulted in approval of the following revision of Interim Amendment No. 77.

**INTERIM AMENDMENT NO. 77.** Table 2, 1940 National Electrical Code. Approved October 15, 1942. Revised February 10, 1943.

Revise the heading of the last column of the table to read: "Weatherproof, Type WP, Slow-burning Weatherproof Type SBW and Slow-burning Type SB."

**INTERIM AMENDMENT NO. 65.** Section 2357, 1940 National Electrical Code. Approved June 30, 1942. Revised February 10, 1943.

Amend the first sentence of section 2357 to read:

A service switch shall have a rating not less than the load to be carried as determined by section 2203.

**INTERIM AMENDMENT NO. 83.** Section 3382, 1940 National Electrical Code. Approved February 10, 1943.

Revise section 3382 to read:

3382. Use. Approved service-entrance cable (Types SE and ASE) may be used in interior wiring systems if all the conductors of the cable are of the rubber-covered type; but if without individual insulation on the grounded conductor may be used only for range and domestic water-heater circuits, or as feeders from a master service cabinet to supply other buildings, or as service conductors for such other buildings, if the following conditions are met.

a. The cable has a final non-metallic outer covering.

b. The supply is alternating current not exceeding 150 volts to ground.

## RESTRICTION ON ELECTRIC CONTROL

Controllers for electric motors have been added to the list for conserving critical material. General conservation order L-250 requires simplification of design and construction of practically every type of motor controller including manual and magnetic starters and controllers, speed regulators, relays, overload and overheating protection,

ONLY AN ELECTRICAL WHOLESALER COULD THUS SPEED WAR PRODUCTION



## WESCO restored war plant 28 days faster

### *Beat Flood Damage by Prompt Service on 22 Electrical Products of 6 Manufacturers*

This factory, overwhelmed for 7 days by sudden winter floods, makes a weapon vital to our men in battle. Completely inundated, the manufacturing equipment and machinery were ruined for production. Facing an indefinite shut-down, the plant called the nearest Wesco House asking for 22 electrical products made by 6 manufacturers.

Wesco began immediate delivery of safety switches, fuse holders and mountings, links, fuses, tapes, wire and cable, and kept pace with the repair crews. This was a job only an Electrical Wholesaler could do. For the purchase of these 22 items direct from the manufacturers meant a delay of 4 weeks before the plant could get on with the war. The Works Manager wrote Wesco—

"On behalf of our entire organization, I wish to extend our sincere appreciation for the assistance rendered to us by your Company during our recent flood experience. We all feel your help contributed greatly to our ability to resume operations at an early date." The Wesco service that now speeds war production will someday win peacetime victories for American industry.

#### WESCO SPEEDS WAR PRODUCTION

- \* After five weeks of waiting for manufacturers' delivery of urgently needed floodlighting equipment for emergency airfields, the airlines company appealed to Wesco. The entire shipment was on its way in 18 days after Wesco received the order.
- \* A war plant was threatened with a production tie-up unless a critical product was obtained. 60 days was the best delivery promise of a manufacturer. Wesco made delivery in 24 hours!

#### WESCO SERVES BUSINESS

- \* By offering prompt delivery of electrical items from large stocks.
- \* By maintaining perpetual inventory stock records.
- \* By knowing local and national codes and rulings.

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150 VARICK STREET • • • NEW YORK, N.Y.

A NATIONAL DISTRIBUTING ORGANIZATION WITH 80 BRANCHES

**"I don't have to  
disturb conduit  
to CHANGE  
BOXES!"**



### Because Every Kondu box is a UNION!

You will appreciate this Kondu feature every time you have to make a change in one of your conduit lines.

**Only with Kondu** can you lift out one box and put in another, without disturbing conduit. (Or if necessary, you can install a conduit line before the fittings are delivered.)

**Use Thin-Wall or Thick-Wall** conduit—at ANY outlet of ANY Kondu fitting—making either a Threadless or Threaded connection. Just insert the suitable bushing.

**Self-Locking** . . . Kondu gives you a rigid, permanent, vibration-proof connection. Roomy enough for all splices. 100% re-usable . . . practically unbreakable.

Write for the Kondu Catalog.

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Erie, Pa.

Now in our  
new plant,  
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12th St.



# KONDU



The Threadless Fitting Line  
Unsurpassed Variety



*In the News*

[FROM PAGE 114]

rheostats, solenoid, thruster and torque brakes, pilot devices, limit, float and pressure switches. Not included are wiring devices and snap switches rated 15 amp. or less, safety switches, fuses, air circuit breakers and oil circuit breakers.

1. All control circuit wiring shall follow a straight line between terminals except to avoid electrical or mechanical interference.

2. All wiring carrying 15 amp. or less shall be no larger than No. 14 AWG except to avoid abnormal voltage drop and heating.

3. All buses, connecting straps and terminals shall be of the smallest commercial size necessary to prevent a temperature rise of 50° over a 40° C. ambient when carrying full load current of the motor for which it is designed.

4. Color coding is restricted to one color per each voltage used.

5. Contactor ampere rating shall conform to specified maximum ratings.

6. General purpose single motor controllers rated 600 volts or less shall not

include control circuit fuses or disconnect switches; and shall not include a control transformer unless master switches or pilot devices of the necessary rating are unobtainable.

7. Resistance, impedance, reactor or auto-transformer a.c. controllers shall not be provided for polyphase induction motors of 20 hp. or less rated 600 volts or less.

8. Floor mounting type steel enclosing case or steel cabinet rated 600 volts or less shall not be provided.

9. No controller shall be provided with test jacks or test receptacles.

10. Instruments, meters, potential and current transformers and metering shunts shall not be supplied on control panels for a.c. motors less than 1,000 hp. and d.c. motors less than 50 hp. with a certain few exceptions.

11. No aluminum, copper, chromium, nickel, cadmium, or alloys thereof shall be used in enclosing cases, nameplates, identification plates, or door handles.

12. Use of stainless steel has been restricted to only essential application for satisfactory operation.

Only orders for controllers and parts bearing an AA-5 or better may be accepted.

Controllers for use aboard ship owned and operated by the Army, Navy, Maritime Commission and War Shipping Administration are exempt from the order. The



"Hereafter be more careful to specify what kind of switch on your PDIA application."



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terms are in effect now for orders placed, and is effective for deliveries after May 14. It is expected that 3,500,000 pounds of copper; 150,000 pounds of stainless steel and 12,000 tons of carbon steel can be saved through strict adherence to these measures.

## MPR 251 INTERPRETATION

Agreements may be filed temporarily with price data later under certain conditions according to a recent MPR-251 interpretation.

Where the contractor undertakes a construction and maintenance service pursuant to a "letter of intent", rather than an actual contract, and the contractor cannot report within the prescribed time all the information required by the regulation, the contractor satisfies the reporting requirements if he files within the prescribed time a letter setting forth all of the details available and reports the rest of the information required as soon as it is available.

Where during the course of a construction job which is priced on a cost-plus basis, the contractor supplies services or sells materials in addition to those originally contemplated, the contractor need not file a report for the additional services or materials provided they do not constitute new or separate contracts. However, if the job is performed on a "lump-sum" basis the contractor must report any substantial additions within ten days after entering into the agreement to supply the additions, unless they involve only minor departures, in which case they may be noted on the final report.

## NECA CODE APPOINTMENTS ANNOUNCED

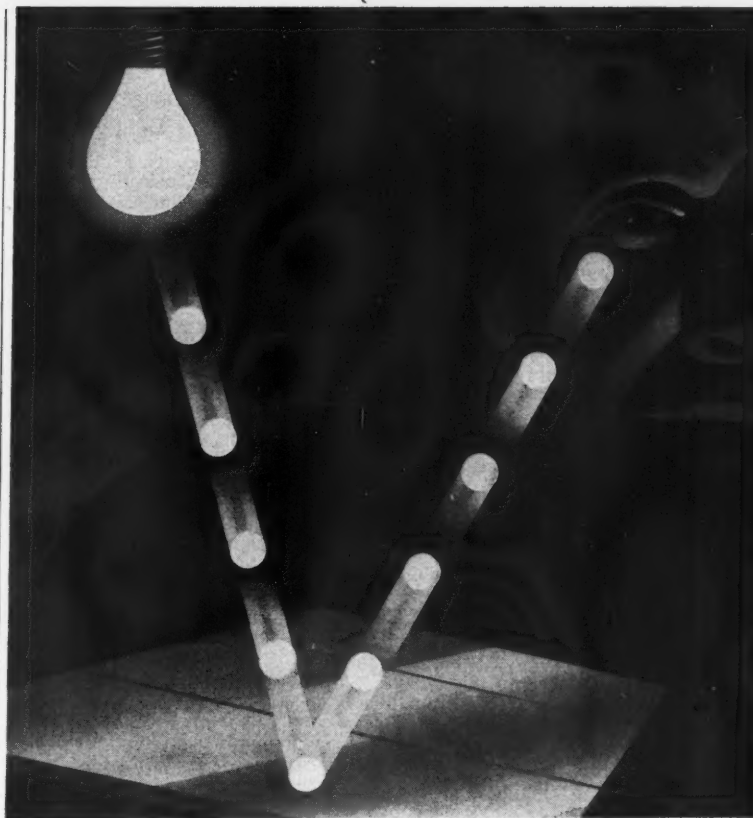
Electrical contractor representatives on the Electrical Committee, N.E.P.A. are announced by the National Electrical Contractors Association, as follows: Members: Allan Coggeshall, New York, N. Y.; George Andrae, Milwaukee, Wisconsin. Alternates: Robert Denike, New York, N. Y.; Wm. Biester, Philadelphia, Pa.; John Kuehne, Detroit, Michigan; L. T. Souder, Washington, D. C.; D. B. Clayton, Birmingham, Ala.; T. W. Wilmer, Richmond, Va.

## WAR CONSTRUCTION ACTIVITY

War construction activity in 1942, which reached a total value of \$12,145,059,000, more than doubled the 1941 volume and amounted to more than 97 percent of the program for the year.

Direct military construction during 1942 was three times the volume of the previous year, and factory construction was two and one-half times the 1941 total. Housing construction in the war production areas maintained the 1941 level, while construction of privately financed factories declined.

The monthly volume of construction, which reached a peak of \$1,406,015,000 in



## LIGHT BOUNCES LIKE A BALL

THAT'S what reflection is—the rebound of light upon impact.

Unlike a bouncing ball, light does not lose its speed—but its quality is altered and its intensity reduced, depending upon the kind of surface it strikes.

Controlling light for industrial illumination is a matter of controlling these bounces. White porcelain enamel because of its characteristics provides the best known surface for

this purpose. Uncle Sam knows this. Therefore, no restriction has been placed on porcelain enameled incandescent reflectors for essential industries.

Because eyes are the skilled workman's most valuable tool, Goodrich lighting specialists are devoting their full time and energies to increasing war production through better illumination with porcelain enameled reflectors. They can help you.



Higlight



Stocklite



Diffuse Floodlight



Seprable RLM Dome



Protecting vital plants with floodlighting — saving man-hours in production  
—Goodrich industrial fixtures are serving America's war effort everywhere.



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Further, the DOLPH Laboratories double check the production of the plant. Samples are taken from every batch of varnish and are tested to see that they conform in every way with predetermined characteristics of the varnish.

As a final check, varnish coated paper strips and cups of varnish are baked. These are checked to see that they conform in build up, dielectric strength and possess maximum acid, alkali, moisture and oil resistance.

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**JOHN C. DOLPH COMPANY**

Insulating Varnish Specialists

169-A Emmet St., Newark, New Jersey

*In the News*

[FROM PAGE 117]

August, declined for the fourth successive month to \$973,285,000 in December, a 31 percent drop from the year's high. The decline in monthly volume from November to December was 13 percent. As an indication of the trend for 1943, there was a further decline of eight percent for January.

As a total, direct military construction in December was 16 percent under the November figure and the downward trend continued through January.

War housing and public works construction dropped from \$121,671,000 in November to \$120,000,000 in December, a decline of one percent. Privately financed housing and public works construction showed moderate decreases, while government financed war housing showed a gain of five percent.

Activity on government financed industrial expansion, including construction volume and machinery and equipment deliveries combined, which reached a total value of \$641,005,000 in November, dropped to \$605,458,000 in December, a loss of six percent. The volume of factory construction continued downward, being off 12 percent from November, while machinery and equipment deliveries showed a gain of one percent. Further increases in machinery and equipment deliveries, and decreases in plant construction, are forecast for the next few months.

Plant construction work done for the Defense Plant Corporation in December was three percent less than in the previous month, while machinery and equipment deliveries in this category increased eight percent. Construction work at Army ordnance plants continued to drop sharply with machinery and equipment deliveries still increasing.

By type of facility, construction decreases occurred in all categories except aircraft. Machinery and equipment deliveries increased at aircraft plants, and at plants manufacturing machinery and machine tools, and other industrial facilities. Notable increases by individual type occurred at synthetic rubber plants, where the construction volume in December was three times as great as in November, and at tank plants and machine tool plants, where machinery and equipment deliveries doubled.

## MOTOR PRODUCTION TO BE SCHEDULED

Recommendations for scheduling electric motor production were discussed at a recent meeting of the Electric Motor Industry Advisory Committee with officials of the War Production Board. These plans will tie into the general scheduling activities of the Director General for War Production Scheduling and with General Scheduling Order M-293.

Much of the unevenness in production to date, the committee pointed out, may be

102 engineers and scientists  
make the

## STANDARD HANDBOOK for ELECTRICAL ENGINEERS

dependable and practical for you

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Power Plant Economics  
Power System Electrical Equipment  
Power Transmission

Power Distribution  
Wiring Design - Commercial and Industrial Buildings  
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Industrial Power Applications  
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Electricity in Transportation  
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Electrical Contracting, April 1943

charged to a lack of complete and coordinated information—a lack which the application of scheduling procedure should rectify. Various methods of acquiring necessary information and setting up the schedules were discussed, and the committee agreed that an experimental schedule should be made up to discover the most practicable method of scheduling.

## NECA NAMES REPRESENTATIVES ON ASA COMMITTEE

The American Standards Association has set up a reorganized Sectional Committee-C42 to revise and bring up to date the American Standard C42, "Definitions of Electrical Terms," which was initiated in 1928 but not made available in printed form until last year. Over 12,500 copies of this glossary of terms and definitions now have been placed throughout the electrical and allied fields.

The National Electrical Contractors Association, which was represented on the original Sectional Committee in the preparation of the present American Standard C42, has appointed the following two representatives to serve on the reorganized Sectional Committee C42 for the revision of the definitions book: Member, William H. Biester, Jr., Electro Construction Co., Philadelphia, Pa. Alternate, T. W. Wilmer, Chewning & Wilmer, Inc., Richmond, Va.

## USED WIRE AND CABLE

An interpretation has been made on the price determination of used wire and cable. For determining maximum prices, if a seller sold used wire and cable on October 15, 1941, he should apply to his sales the average percentage margin over his net invoice and cost; if the seller did not sell used wire and cable on October 15, 1941 he must report to OPA his proposed price which may be disapproved by OPA within 30 days after receipt of the report.

## CHICAGO INSPECTORS HUNT DOCTORED FUSES

The campaign against plugged, padded, shorted and over-rated fuses in the Chicago area is in full swing. It is not designed as a means of bringing violators to justice, but is more of an educational campaign to acquaint owners with the hazards attendant upon such practices and the difficulty, under present priority restrictions, of replacing wiring destroyed by fire or other abuses. The Chicago Electrical Inspectors Department under Dave Talbot is carrying out the program.

When an inspector visits a plant or building he carefully checks, among other things, the sizes of fuses and setting of other circuit protective devices. He makes a complete record of his findings and notifies the

# RE-LIGHTING

*the new manpower requirement*

## OPERATION STUDY SHEET

Working Conditions	<i>Light glare, causing hazardous working conditions - high accident rate on this section</i>
	<i>delays - new worker</i>
Machine No.	<i>340</i>
Capacity	—
Size	—
Department	<i>N-32</i>



## *Vital* to accident-rate reduction

Glaring or insufficient light that makes seeing difficult is one of the principal reasons for lost-time accidents. *Re-lighting* your plant will help you save many of these man-hours of production, particularly on your night shifts.

Most plants operating today were designed and built for peacetime, daylight working schedules. *Lighting based on daylight conditions is inadequate to serve the needs of night workers.*

Re-lighting does not mean discarding your present lighting system. It merely means increasing the efficiency of your present equipment by re-locating lamps to eliminate glare and shadow, increasing lamp wattages where necessary, or installing additional equipment to insure uniform lighting levels. A Silv-A-King lighting engineer can tell you exactly what you need and how little re-lighting will cost.

Silv-A-King has specialized in industrial lighting for 22 years. Silv-A-King quality equipment (fluorescent or incandescent) plus a Silv-A-King "engineered layout" makes an unbeatable combination.

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1033 Metropolitan Avenue, Brooklyn, N. Y.



Send for your copy of our 16-page book: "Light Is An Essential Production Tool"



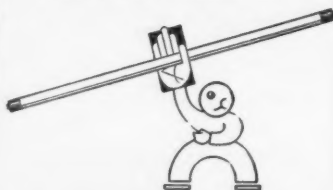
## **BROIL KING** AFTER THE WAR, MORE THAN EVER America's Finest Electric Table Broiler

INTERNATIONAL APPLIANCE CORPORATION

1027 Metropolitan Avenue, Brooklyn, N. Y.



## "LONG LIFE"\*



### BANISHES AN OLD BUGBEAR OF FLUORESCENT LIGHTING

**Artkraft Resonant Starting  
Makes Unnecessary the Use  
of the Starter Switch**

#### BUT



This is only part of "Long Life's" story, for only Artkraft gives you a 3,000-hour guaranteed fluorescent lamp—a lamp with a rated life of 5,000 to 6,000 hours!

Field tested for over five years, these Artkraft lamps feature a corrugated mesh-ribbon filament, which permits the use of abundantly more emissive compound. Controlled temperature of this filament by means of a Constant-Temp feature, furthermore prevents rapid discharge of this compound.

Artkraft lamps stay brighter longer, since blackening in the light column is reduced by the cathode design.

Efficient operation at 85 to 135 volts is made possible by Artkraft's Constant Voltage Power Pack. Also adaptable to single or three-phase 220- and 440-volt systems.

100% Power Factor at rated voltage and 98% or over within the 85 to 135-volt range.

"Easy Mount" Luminaire permits instant removal without tools, for cleaning non-ferrous reflector or lamps.

Stroboscopic (flickering) effect has been substantially reduced.

Artkraft gives more light for the same current.

Moderate first cost. Radically reduced maintenance cost. Lamp replacements are far less frequent, starter replacements are eliminated, ballast replacements unknown, and many man-hours are saved by making these replacements unnecessary.

**Write for Circular F 102**

#### WHOLESALESALE:

Write for our proposition.

#### FIXTURE MANUFACTURERS:

Write for details on fixture manufacturing license.

### ARTKRAFT HOT CATHODE FLUORESCENT LIGHTING

Division of  
**THE ARTKRAFT SIGN CO.**  
1113 E. KIDNEY ST.  
LIMA, OHIO, U.S.A.

\* Reg. U. S. Pat. Off.



[FROM PAGE 119]

owner of any existing improper circuit protection. This report is also filed with the City Electrical Inspection Department.

The inspector's visit is then followed up by a two-page letter from the Inspection Bureau pointing out the need for proper circuit protection and the prevention of fuse tampering together with a record of the fuses and circuit protection now in the building and a recommendation as to the sizes that are necessary under present load conditions.

Violations are pointed out in the letter but it is made plain that there is no intention of invoking the penalties now. However, if upon re-inspection the condition is found to be uncorrected, action will be taken to assure that safety to life and property is not jeopardized.

It is a component part of Mr. Talbot's all-out campaign to maintain electrical safety while conserving critical materials along the electrical front.

### COMING MEETINGS

**Midwest Power Conference**—Palmer House, Chicago, Illinois, April 9-10.

**National Electrical Manufacturers Association**—Spring Meeting, Palmer House, Chicago, Illinois, April 19-23.

**North Central Electrical Industries**—War-time conference, Hotel Radisson, Minneapolis, Minn. Participating groups include: North Central Electric Association; Minnesota Municipal Utilities; Minnesota Electrical Inspectors; Minnesota Electrical Council (contractors and dealers); and North Central Electrical Industries. April 26-27.

**National Fire Protection Association**—Palmer House, Chicago, Illinois, May 10-14.

**National Electrical Wholesalers Association**—War Conference, Statler Hotel, Buffalo, N. Y. May 23-26.

**International Association of Electrical Inspectors**—Western Section, 39th annual meeting, Chicago, Illinois, Sept. 13-15.

### OMAHA SHOPS DIVERSIFY ACTIVITIES

Most Omaha electrical shops, both in the construction and motor repair fields, have little fear of what lies ahead when new war plant construction nears the vanishing point. Prime reason is that they are now engaged in work either directly or indirectly connected with essential war production. Diversification of activities is the scheme generally followed.

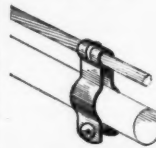
Typical contractor example is the Sterling Electric Co., who formerly specialized in electrical construction and the fabrication of custom made lighting fixtures. All of their large machine shop is now turning out parts for the various branches of our armed services. In addition they are rust-proofing metals by a patented process known as "Parkerizing". To keep their trenching equipment from gathering rust



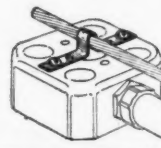
## New Practical Unit to Cut Installation Time

• The "Messenger Hanger" and the "Messenger Strap" fill the need for an economical, practical, time-saving unit for use with the new messenger cable type of installation. Mechanically strong, durable, lightweight. They have considerable material and are easily and quickly installed. Our bulletin gives full and complete details—send for it.

See your Jobber.



"Messenger Hanger" for Conduit and Cable Strong, made of Cadmium Plated Steel or Everdur. Top loop of hanger grips messenger cable to permit conduit to be put in place without falling off.



"Messenger Strap" for Outlet Boxes Of Cadmium Plated Steel or Everdur. For messenger cable installation to be used with Minerallic "Messenger Hanger." Fits all standard outlet boxes and 1/2" messenger cable.

**MINERALLAC  
ELECTRIC COMPANY**  
New York City Office 50 CHURCH ST.  
THEODORE B. DALLY  
25 N. Peoria St. Chicago

## MULTI Reflectors

installation and  
maintenance simplicity



• MULTI Incandescent Reflectors are all-time favorites with contractors. Not only do they give good service for long periods but they retain high efficiency with just ordinary care and maintenance at regular intervals. Every installation is profitable and satisfactory—they are really "designed for the job."

Let us send you our complete catalog



**MULTI**  
ELECTRICAL MANUFACTURING CO.  
1840 W. 14th St., CHICAGO, ILL.

and dust, they are trying for—and getting—sewer contracts. An appliance repair department is more than busy these days. And their electrical construction department is now functioning in a joint venture enterprise with the Bradley Electric Co., and the Dodson Electric Co. both of Omaha.

An outstanding example of "doing the most we can with what we have" is the Industrial Electrical Works, motor service shop. All of their machine shop is now making different parts under subcontract to various prime war contractors. And when he can't get the necessary machines, B. Stahmer, the owner, makes them himself. Exhibit A is a double spindle milling machine which he made in about six weeks with the aid of a couple of synchronous motors, gear reducers, hydraulic ram, and a little of his ingenious design talent. Total cost was a small fraction of what he would have had to pay for a machine to do the special job and more important—he was in production in six weeks. Other ingenious jigs and gadgets have multiplied the jobs that his conventional machines can do.

The Henry W. Miller Electrical Service, now doing considerable electrical construction for the government throughout the midwest has added an appliance repair department and is now working on the development of a motor repair department.

And so the shops are learning to divert their activities and talents, not only as a cushion for themselves in case one phase of their work falters, but also as a means to increase their effective effort in the all-out effort to win this war. Others are catering primarily to the repair and maintenance field so there is a balance of service facilities to handle this type of work.

## *Priorities*

### NEW ORDER ON CONSTRUCTION EQUIPMENT

The types of materials, which in future construction projects may be assigned preference ratings, has been substantially broadened by WPB.

Under a new order, preference ratings may be assigned not only to construction material but also to tools, machinery or equipment which will be located in the project and which will be used there in the manufacturing or processing of goods on the performance of services. Ratings may also be assigned to any material which will be used in connection with the construction of the project, including hand tools, repair parts for construction machinery, farms, scaffolding, and the like. Construction machinery and fuel are not included.

The War Production Board will continue to assign preference ratings to all commodities, equipment, and accessories which will be physically incorporated into the project.

The new order, P-19-h, also restricts

... full speed ahead



We at DELTABESTON have plotted our course to accomplish one vitally important task. And now it's full speed ahead... to supply dependable wires and cables in sufficient quantities to help win the war sooner.

Today DELTABESTON Asbestos- and Glass-Insulated Cables are used on war projects all over the land:

DELTABESTON Power Cables to transmit and control the nation's electrical power...

DELTABESTON Switchboard Wires to control and distribute the huge volume of power required for manufacturing weapons of war...

DELTABESTON Aircraft Wires to equip our aerial armada with power, lighting and communication systems and numerous other types of cable for essential industries.

But that's only part of our story. Finding solutions for wartime problems has resulted in new kinds of insulation and better protective coverings. These improvements and new ideas must now remain a secret. After the war they will be available to you.

For additional information write to Section Y431-8, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn. G-E Deltabeston Wires and Cables are distributed nationally by Graybar Electric Co., G-E Supply Corp. and other G-E Merchandise Distributors.



**GENERAL  ELECTRIC**

## To Help You Plan and Estimate Wiring Installations

# AUSTIN

### OFFERS

OUTLET BOXES  
SWITCH BOXES  
BAR HANGERS  
LINE-O-LETS  
BOX CONNECTORS  
HEAVY WALL CONDUIT FITTINGS  
THIN WALL CONDUIT FITTINGS  
BUSHINGS AND LOCKNUTS  
CONDUIT AND CABLE STRAPS  
R E A FITTINGS  
TOOLS  
LUGS  
NIPPLES  
WIRES AND CABLES  
ARMORED CABLE  
THIN WALL CONDUIT  
HEAVY WALL CONDUIT

These are just some of the items shown in our new 1942 144-page catalog. It is full of useful information and contains hundreds of illustrations that will be most helpful to you. Send for your copy today—ask for Catalog No. CF17.

**THE M. B. AUSTIN COMPANY**  
110 S. DESPLAINES ST. CHICAGO

TEST INSULATION . . . . .  
the modern, easy way with a

## MODEL B-5 MEGOHMER



No more tiresome cranking of a hand-driven generator. . . . . Our new battery-vibrator type insulation testers operate at a steady test potential of

**500 VOLTS DC**

available at the touch of a switch, portable, entirely self-contained, direct-reading.

Write for bulletin No. 430.

**HERMAN H. STICHT CO., INC.**  
27 PARK PLACE NEW YORK, N. Y.



[FROM PAGE 121]

the builder to the use of only that critical material which is authorized by WPB. Critical material in excess of allowances may not be used, regardless of whether taken from stock, or made available by gift or loan.

This project rating order also enables an applicant to acquire all needed materials on one application. Only in the case of exceptions will the applicant have to file additional papers.

### AUTOMATIC APPROVAL FOR UTILITY CONNECTIONS

Advance approval of limited utility connections for construction or remodeling projects permitted under L-41 is granted in Supplemental Utilities Order U-1-d issued by WPB.

To qualify for such automatic approval, material for an electric, gas, or water connection must cost less than \$1500 in case of underground connection or \$500 in the case of other construction.

In addition, in the case of an industrial or commercial consumer, not more than 60 pounds of copper may be used in an electrical connection or 250 pounds of iron and steel for gas or water service.

In the case of domestic consumers, the material cost limitation is the same as industrial or commercial while the amount of material must be held within the limits established by the Housing Utility Standards issued by WPB.

Previously such connections were granted upon individual application. The change was made because administration of L-41, formerly centered in Washington and New York, has now been placed on a regional basis.

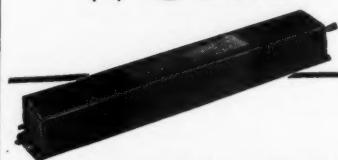
### PR 11 MAINTENANCE CLAUSE INTERPRETED

Use of PRP ratings authorized for maintenance, repair and operating supplies to purchase cranes, monorails, and similar equipment is the subject of an interpretation of Priorities Regulation No. 11.

The provisions of PR 11 which cover MRO supplies permit use of assigned ratings to purchase minor items of productive capital equipment but exclude from this definition any item to be used for plant expansion. The interpretation points out that cranes and monorails costing less than \$200, intended to replace existing equipment or for minor relocation of plant machinery, may be considered "minor capital equipment," but that those costing more than \$500 would not be so considered. Use of the MRO rating for items costing between these two sums must be considered in the light of the size of the plant, the nature of the equipment, and similar factors. In case of doubt, an application for priorities assistance should be made on Form PD-1A.

The interpretation also calls attention to

## MAKING LIGHT WORK



### OF WAR PRODUCTION PROBLEMS

Many production problems are being solved by adequate lighting of important machining and assembly operations. Acme's four-lamp ballasts makes light work; one ballast provides exact operating characteristics for 4-100 watt lamps. Better performance, efficiency and service. Write for Bulletin 157.

**THE ACME ELECTRIC & MFG. CO.**  
36 Water St. Cuba, N. Y.

**Acme Electric**  
TRANSFORMERS

## Sherman GROUND CLAMPS

Speed Up the Job



Sherman today offers one of the most complete lines of Ground Clamps and fittings. It pays to stock and sell the Sherman line. With Sherman you can supply the right clamp for every job—and once you sell them you'll find they repeat.

Write for Bulletins 11, 12, and 22 which catalog the complete line of Sherman high quality, low cost Ground Clamps.



**H. B. SHERMAN MFG. CO.**  
BATTLE CREEK, MICH.



the fact that Priorities Regulation No. 11A provides that Controlled Materials Plan Regulation No. 5 will govern in the case of MRO supplies to be delivered after March 31. As the CMP Regulation sets a limit of \$500 on items of productive capital equipment and minor capital additions which may be purchased under its procedures, there may be some items which constitute maintenance, repair, and operating supplies under CMP Regulation No. 5 which do not fall within the definition of these contained in PR No. 11.

## NEW PD-1A FORM

War Production Board Form PD-1A, "Application for Preference Rating," has been revised on the basis of suggestions from industry representatives and the Industry Divisions of WPB. Copies of the revised form are available in WPB field offices.

Major revisions are:

(1) change from a column-type form, with accompanying instruction sheet, to a block-type question and answer form designed to facilitate application and to reduce to a minimum special requests for additional information; (2) incorporation of the clearance form used in processing the application to speed handling, and (3) addition of some questions not previously asked, to eliminate need for supplemental forms.

In order to allow time for full distribution of the revised form, WPB will continue to process applications filed on the old form until April 1. After this date only the revised Form PD-1A will be accepted for processing.

Two colors have been used in printing the revised PD-1A, yellow to be used in applying for ratings for items which are to be exported without further processing, and white for all others.

Beginning March 1, all PD-1A applications must be filed with the nearest WPB District Office, not in Washington.

After March 15, all applications for ratings on less than \$100 worth of material will be processed in the War Production Board Regional Offices. This preliminary value limitation will be progressively stepped up as the field offices assume greater responsibilities. It is expected that within six weeks, more than eighty percent of all PD-1A applications will be handled entirely in the field.

## PURCHASE OF REPAIR PARTS

Purchase orders for certain repair and maintenance parts of general industrial equipment no longer need to be accompanied by certificates showing that they are exempted from the restrictions imposed by General Limitations Order L-123.

The exemptions, for which certification was formerly required, cover purchase orders for repair and maintenance parts not exceeding \$1,000 in value for any single piece of general industrial equipment or for



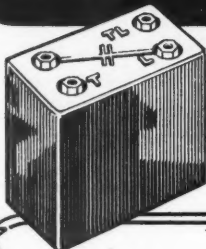
Welding, as a process, is very old but with the advent of electric welding new fields of usefulness were opened up. Along with the rapid development and steady improvement of electric welders there have been equally interesting and important changes in the power and electrode cables used with them. Cables for such service must have flexibility, they must resist abrasion and they must be economical in operation.

Among the first TIREX rubber-sheathed cables designed for special work were TIREX Welding Cables having conductors made up of thousands of small copper wires to obtain flexibility (#4/0 has 5341), a tough rubber sheath for resistance to abrasion and with every promise of unusual serviceability. Performance records have repeatedly shown TIREX Welding Cables to be unexcelled in every way for the work they were designed to do.

TIREX rubber-sheathed Welding Cables are subject to War Production Board restrictions governing the use of copper and rubber but even with necessary modifications they still are suitable for the rough-and-tumble work of welding and can be depended upon for excellent performance. While they are not available for purely commercial uses they should be specified and used by industries on essential war work having high priority.



## MALLORY CAPACITORS



**Withstand the Punishment  
of Constant  
War Production Service**

When you replace capacitors on any electric motor, you will do well to standardize on Genuine Mallory Capacitors. They are built to "take it" — to last longer and give better service.

Remember, too, you can make more replacements with a smaller stock with Mallory Universal AC Capacitors; yet the line is complete. It meets all requirements for both round and square types.

Get in touch with one of the offices listed here or write for the IWI Blue Catalog.

**INSULATION  
AND WIRES, INC.**  
2127 Pine Street  
St. Louis, Missouri



**Insulation and Wires, Inc.**  
30 Trowbridge Avenue  
Detroit, Michigan

**Insulation and Wires, Inc.**  
181 Portland Street  
Cambridge, Massachusetts

**Insulation and Wires, Inc.**  
289 Simpson Street, N. W.  
Atlanta, Georgia

**H. A. Holden Company**  
318 Fourth Avenue, South  
Minneapolis, Minnesota

**W. C. Johnson**  
309 Kellogg Avenue  
Peoria, Illinois

**Tri State Supply Company**  
544 South San Pedro  
Los Angeles, California

**Robert McKeown Company**  
249 High Street  
Newark, New Jersey

## SEARCHLIGHT SECTION

(Classified Advertising)

**Employment Business**  
**Equipment**

(Used or Resale)

### "OPPORTUNITIES"

#### UNDISPLAYED RATE

15 Cents a Word, Minimum Charge \$3.00. POSITIONS WANTED (full or part time salaried employment only), 1/2 the above rates payable in advance.

BOX NUMBERS—Care of publication New York, Chicago or San Francisco offices count as 10 words. DISCOUNT OF 10% if full payment is made in advance for 4 consecutive insertions.

#### DISPLAYED RATE

INDIVIDUAL SPACES with border rules for prominent display of advertisements.

The advertising rate is \$7.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured 1/4" vertically on one column, 3 columns—30 inches—to a page.

NEW ADVERTISEMENTS received by April 21st will appear in the May issue, subject to limitations of space available.

#### POSITION WANTED

ELECTRICAL ADVERTISING and sales promotion manager. Many years full charge department, electrical equipment firm. Experienced placing publicity electrical press. Novel advertising, promotion, production-stimulation ideas. Trained executive, Married, 41H. Well known electrical trade executives. Gilt edged references. PW-302, Electrical Contracting, 330 W. 42nd St., New York City.

#### READY TO SHIP

## REBUILT ELEC. EQUIP.

AC-DC Motors, 1 to 1500 HP

M. G. Sets—Rotary Converters

Transformers

Engine Generator Sets

Pumps—Air Compressors

Switchboards—Meters—Switches

### DUQUESNE ELECTRIC & MFG. CO.

Pittsburgh, Pa.

WE BUY AND SELL  
MOTORS  
TRANSFORMERS  
MOTOR GEN. SETS  
OIL SWITCHES  
AIR CIRCUIT BREAKERS  
ELECTRIC EQUIPMENT CO.  
678 Lake Ave., Rochester, N. Y.  
Tel: Glenwood 6782

#### CONDENSERS

22—3 ph. 230 V. Power Factor Condensers  
—DL-2528946  
1—2 ph. 230 V. Power Factor Condenser  
—DL-2528946

1—3 ph. 430 V. Power Factor Condenser  
1 KVA each. All General Electric.

R. W. STAHL

NORTH HILLS, PENNSYLVANIA



[FROM PAGE 123]

parts needed to repair actual breakdowns regardless of their value.

The original order defines "general industrial equipment" as new equipment of the kinds itemized from time to time in List A attached to the order.

The present amendment also makes a number of changes in List A: Deleted are industrial fans and blowers; industrial pumps, mechanically operated; industrial hand trucks; passenger or freight elevators, incliners, electrically operated passenger elevating devices appurtenant to stationary stairways, and power operated dumbwaiters; electric motors, one horse power and over; motor-generator sets 1 kw., or one horsepower, and above; and electric controllers, rated one horsepower and over.

Added are: electric motors, rated less than one horsepower, except motors used in the operation of passenger automobiles, trucks, truck trailers, passenger carriers and off-the-highway motor vehicles, as defined in L-158, or in the operation of stationary automotive type engines.

## BUILDING MAINTENANCE

A revised definition of what constitutes maintenance and repair of a building is contained in an amendment to Conservation Order L-41. The new definition specifically designates that where a single job is partly maintenance and repair and partly new construction, the whole project will be considered new construction and subject to Order L-41.

In addition, the amendment reduces to \$200 new construction which may be undertaken, without specific authority, by a number of manufacturing enterprises which are not essential to the war program. Moreover, the amendment applies to private dwellings and commercial structures.

Under the new definition, maintenance and repair means the work that is necessary to keep a structure in sound condition, but does not include any building operation involving a structural alteration or change in design.

The amendment to Order L-41 brings into the foreground these other principal changes in the regulation of construction.

1. Provision is made for emergency work on any damaged structures for the protection of the structure and the public.

2. In prohibiting construction in violation of L-41, the amended order forbids not only the beginning of such construction but also forbids carrying on or participating in the work.

3. The cost of construction as defined in the order has been narrowed to exclude financing and insurance charges as elements of cost.

4. The exemption of certain types of agricultural construction is permitted to reflect the USDA rationing program.

The order, as amended, provides that no

## EVERY PHASE of electrical maintenance and repair work covered in this library



5 volumes of practical how-to-do-it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

## Electrical Maintenance and Repair Library

2042 pages, 1721 illustrations and diagrams

These books show you how to

- install all types of motor and generator units;
- locate breaks in armature windings and do a workmanlike job of rewinding;
- know just what is wrong with an electrical machine and take charge of installation and maintenance work;
- make accurate tests of switchboards and apparatus and correctly balance the power with the load;
- handle every sort of wiring job;
- show competence whether it be in the use of a Stillson wrench or a Wheatstone bridge.

### Includes trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a book giving helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery trouble, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

10 days' examination  
Easy monthly payments

We want you to examine this Library for 10 days. If you don't want them at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

## EXAMINATION COUPON

McGraw-Hill Book Co., Inc.  
330 W. 42nd St., New York, N. Y.

Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you \$1.00 in 10 days, and \$2.00 a month until \$15.00 has been paid. Otherwise I will return the books postpaid.

Signature .....  
Address .....  
City and State.....  
Firm or Employer.....  
Position .....EC. 4-43

Electrical Contracting, April 1943

construction may be begun or carried on unless it is specifically authorized by the War Production Board or unless the estimated cost of the project is limited to stated amounts. These amounts limit construction to \$200 for residential and some specifically mentioned types; \$1,000 for multiple residential; \$1,000 for agricultural; \$5,000 for industrial; and \$1,000 for "other restricted" construction not otherwise classified.

In prohibiting unauthorized construction, WPB acted to restrict anyone who might complete a structure started in violation of Order L-41, or anyone who might participate in the job, such as architects, engineers, and the like.

In addition to redefining costs so that financing and insurance charges are no longer considered elements of cost, the order also excludes the cost of production machinery or equipment to be used directly in manufacturing for the purpose of determining whether a certain job is exempt under the terms of the order.

Agricultural construction was exempted from the Order, where the construction is necessary to the installation of material or equipment, the distribution of which is controlled by certain other orders. This exemption is ordered to remove a second unnecessary control on farmers by Order L-41.

Where a structure has been damaged or destroyed by disaster, the order now expressly exempts such construction work as is necessary to protect or make safe the building or its contents. This permits the shoring up of walls of a damaged structure, or other similar work necessary to protect the property, its contents or the public.

An additional exemption is allowed for construction which is necessary to restore or replace residential or multiple residential structures damaged or destroyed by disaster, provided that the estimated cost is less than \$5,000. In these cases, Form PD-200 must be filed within two weeks after the damage or destruction occurs.

## WITH THE Manufacturers

### D. H. O'Brien Retires

After 26 years of service with the Graybar Electric Co., D. H. O'Brien, vice president, has retired to devote himself entirely to his new work in the Signal Corps.



Mr. O'Brien will head the new Field Service Division of the Signal Corps of the Army. Acting in civilian capacity, Mr. O'Brien will supervise the coordination of distributing signaling equipment and spare

in both interior zones and theatres of combat.

### G-E Appointments

T. O. Eaton has been appointed assistant manager of sales, of the Power Transformer Section at General Electric Company's Pittsfield Works.



R. S. Neblett, who was assistant manager of General Electric's Turbine division, has been appointed assistant manager of the Company's Federal and Marine Division.

The General Electric Radio, Television and Electronics Department will hereafter be known as the Electronics Department.

**Crocker-Wheeler Electric Manufacturing Company** of Ampere, N. J., has named A. J. M. Baker as general manager. Mr. Baker was formerly with the British Purchasing Commission.

**The Wiremold Company** of Hartford, Conn., has appointed J. E. Love as district manager to succeed H. C. Moran, who recently retired. Mr. Love's headquarters are located at 802-B Law and Finance Building, Pittsburgh, and he will cover Western Pennsylvania, Ohio, West Virginia and Kentucky.

**The Steel and Tubes Division** of Republic Steel Corporation has announced the promotion of J. A. Ireland to assistant general manager of sales. Mr. Ireland previously held the position of division sales manager.

## More Gossip

### Quirks of Fate

Paul W. Gardner, joint owner of Sharper and Gardner, electrical contracting firm of Indianapolis, Ind., found himself, by a strange twist of fate, in a position that has frequently been visualized but apparently never materialized.

Paul's firm had been doing considerable electrical work at Indianapolis' Stout Field Air Base and when their contract was over, he stayed on as a civilian superintendent of electrical construction at the base. In the interim, he was reclassified by his local draft board as Class 1-A material. In a few weeks he was in the Army as a buck private.

Imagine the surprise of his friends at the air field when Private Paul Gardner reported at the same field and was assigned the identical job he had held before as a civilian. After more than two months in the service, Paul is now wearing technical sergeant's stripes and is well on his way to a commission.



*KEPT BUSY by the WAAC's, H. S. J. Towner, Towner Electric Co., Des Moines, enjoys a breathing spell between electrical jobs at Fort Des Moines and the hotels taken over by the government for the WAAC's.*

### New Officers Elected

The Electrical League of Richmond, Virginia elected the following officers for the year 1943: A. H. Herrmann, President; Leon L. Bond, Vice President; W. W. Jones, Treasurer; and A. B. Schad, Secretary.

### Now a Director

E. R. Habermehl, electrical contractor of Milwaukee, Wis., has recently been elected a director of the Bay View Businessmen's Association in that city.

### Beehive of Activity

Jack Pilmer's Electrical Engineering and Construction Company, Des Moines, is buzzing with business these days, taking care of routine work, repairs and delving into war subcontract work.

The motor service shop is operating at 250 percent normal on a three shift basis—the two swing shifts being somewhat light. Production schedules call for a six day week with a maximum of 50 hours per week for each man.

Biggest single item is a war subcontract with a large ordnance plant, requiring about 95 percent of the machine shop capacity.

To expedite this contract for making ordnance accessories, Jack moved practically his entire machine shop to the ground floor, leaving a skeleton group of machines for ordinary and special motor repair work.

The manpower problem was partially solved by employing women—even to the extent of a lathe operator. And they seem to be working out fairly well.

Since the company is up to its ears in war work, Jack spends a good part of his time on the long distance telephone and his monthly phone bills look like surgeons' fees.



## TIME SWITCHES

TRIPLE POLE  
DOUBLE POLE  
SINGLE POLE

All three types can be furnished with capacities ranging from 20 TO 200 AMPERES PER POLE, listing from \$16.50 up. Ten ampere Time Switches from \$3.95 up.

## PROCESS TIMERS

INTERVAL TIMERS, or PROCESS TIMERS, are furnished in two types. One is reset by hand (manual); other resets itself, automatically. Both types can be provided for practically any cycle of time, fully adjustable from zero to maximum period. SYNCHRONOUS, SELF-STARTING MOTORS.

## SIGNAL TIMERS

Used extensively for starting and stopping industrial work; school class periods; for municipal time signals, etc. Up to six signal periods, permanently set at factory with Sunday & Holiday Cutout and Manual Control, at a list price of only \$35.

Write for Information

**AUTOMATIC ELECTRIC MFG. CO.**  
MANKATO, MINNESOTA

## Safe-T-Glow

### HIGH TENSION DETECTOR



**SAFETY RULES** call for that EXTRA precaution and additional RECHECK which SAFE-T-GLOW provides. Detects accidental tie-ins, crossovers, leakages and induced voltages... prevents serious injury and loss of life. SAFE-T-GLOW consists of a sensitive Neon tube, amplified by mirror reflector.

Model A for circuits 2,000 to 35,000.  
Model B for circuits from 35,000 to 220,000 volts.

## TEST-O-LITE

Tests Everything Electrical  
from 100 to 550 Volts



Equipped with Neon light which tells instantly where trouble lies in circuits, fuses, cut-outs, motors, etc. Indicates hot or grounded wires. Tells AC from DC. SAVES PRECIOUS TIME. Has PATENTED safety features. Vest pocket size with clip. Lifetime guarantee. List Price \$1.50 at leading jobbers.

**L. S. BRACH Mfg. Corp.**  
55-63 Dickerson St. Newark, N. J.

## More Gossip

### Toledo Contractors Elect Taylor

O. H. Taylor was elected president of the Toledo Electrical Contractors Association, Inc., at a recent meeting of that organization. Max Romanhoff was chosen as vice-president and C. F. Hammer continues as secretary of the group.

### '43 Slate for St. Louis Group

The Electrical Contractors Association of St. Louis, Mo., recently re-elected all its officers for the coming year. These include: Carl I. Schaeffer, president; S. C. Sachs, vice-president; and Ed Mueller, treasurer. Carl H. Christine was reappointed secretary and Russell E. Vierheller remains as business manager of this NECA Chapter.

Elected to the Board of Directors were: C. I. Schaeffer, S. C. Sachs, Ed Mueller, A. H. Leopker, E. L. Markland, and F. A. Rick.

### Howard Miller Heads Philadelphia Contractors

Howard L. Miller, Utilities Engineering Co., was elected president of the Electrical Constructors, Philadelphia Chapter, NECA. Stanley M. Cameron, H. P. Foley Co., is the vice-president. William E. Rubert, Union Electric Co., was elected secretary-treasurer of the group.

Chosen as directors of the organization were Howard R. Banyard, Enterprise Electric Co.; and Wm. H. Biester, Jr., Electro Construction Co. E. E. Hedler remains as business manager of the group.



**CURING THE ILLS** of worn out appliances is a daily task of Henry H. Hansen, owner of Allied Electric Co., Lincoln, Neb. Henry's repair work has trebled since our entrance in the war. The older they come, the bigger the challenge.

## If You Are Having Difficulty Maintaining Your Mailing Lists...



**Mc GRAW-HILL**  
DIRECT MAIL LIST SERVICE

Probably no other organization is as well equipped as McGraw-Hill to solve the complicated problem of list maintenance during this period of unparalleled change in industrial personnel.

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DIRECT MAIL DIVISION

330 West 42nd Street New York, New York

## The Stone You Can Bend and Twist

## Flex-Stone

DRESSES  
AND CLEANS  
ALL ELECTRICAL  
PARTS AND  
CONTACTS

What a job FLEXSTONE does! Cuts like an abrasive stone—but you can bend, twist it. Won't break! Thin, non-brittle. Sharpest abrasives are pressed into flexible core. Easily fits tight places. Smooths hardest contact points in relays, cutouts — cleans small commutators, switches, etc. Non-conductor — no short circuit. Rimac FLEXSTONE speeds electrical service. Send for free sample!

**RINCK-McILWAINE, Inc., 16 Hudson St., New York, N. Y.**

## Welded Cable Ducts

[FROM PAGE 35]

from their various branch offices throughout the country, special equipment and facilities are provided to meet their requirements. Western Union provides ducts for the distribution of telegraph cable of required capacity to the private companies equipment in a like manner to that above, with additional provisions for a.c. and d.c. power and lighting circuits. Since these offices are of smaller capacity than the average telegraph office and their requirements being more or less confined to limited areas, special means are necessary to provide power wires without sacrificing too much valuable space. The incorporation of all these wires and cables into one three-compartment duct has been the answer. The advantages can be readily seen over the previously accepted methods of running cables and power wires on the ladder-type racks and in conduits respectively, which meant providing an involved horizontal and vertical pipe structure. Installations have been made of this three compartment duct and the system has proved very successful.

Estimated savings in using the three compartment duct over the ladder type cable rack with an additional system for power wires have been 30 percent on material cost and 50 percent on labor cost.

Based on actual experience, the resultant over-all saving in a complete installation of the arc-weld duct over the older type was approximately 50 percent.



**EDDY CURRENT** dynamometer test is being applied to a rewound motor at the Sullivan Electric Co. shop, Cincinnati, by shop superintendent Al Hansen. Rotating disc behind instrument panel is mounted on a floating cradle.

# WHERE TO BUY

## Equipment, Materials and Supplies for Electrical Construction — Maintenance — Repairs



The TORK CLOCK CO., Inc  
MOUNT VERNON, NEW YORK



**WODACK "DO-ALL"**  
**ELECTRIC HAMMER AND DRILL**  
Saves time and money installing expansion anchors. Drills concrete to 1 3/4" dia.; metal to 3/4". Two tools in one. Easy to maintain. Universal motor. Write for folder.

Wodack Electric Tool Corporation  
4628 W. Huron St. Chicago, Ill.  
Telephone AUstin 9866

## ELECTRICAL CONSERVATION

MEANS FUSING WITH  
**LITTELFUSES**

3 A G. Underwriters Approved 17 sizes,  
1/100 to 8 amps, 250 volts. Wide industrial application. Data available.  
**LITTELFUSE INC.** 4789 Ravenswood Ave.  
Chicago, Ill.



## Whenever YOU NEED PRODUCTS

not advertised in a particular issue, ask the advertisers—or write us. We will gladly ask them for you.

This Where to Buy Section supplements other advertising in this issue with these additional announcements of products essential to efficient and economical operation and maintenance. Make a habit of checking this page, each issue.

### Departmental Staff

**ELECTRICAL  
CONTRACTING  
NEW YORK CITY**



## ZENITH Magnetic CONTACTORS

can take it. Quiet too. AC hum reduced to minimum. Rolling-wiping action. Ample contact pressure. Quick opening switch. For time switches, flashers, blackout uses. Severest duty, 30 to 400 amps. Many other Zenith control units, catalogued. Write.

**ZENITH ELECTRIC CO.**  
152 W. Walton St. Chicago, Ill.

## NEW ELECTRIC MOTOR PARTS

FOR ALL MAKES

[One of the largest consolidated stock of motor, fan and controller parts on the east coast.]

Write for Catalogue

**READING ELECTRIC CO.**  
INCORPORATED

200 William St. New York City



## Complete Line OF SOLDERING FLUXES

We have "the proper flux for every soldering job"

**L. B. ALLEN CO., INC.**  
6715 Bryn Mawr Ave., Chicago

Take The **HIGH** Cost  
OUT OF ANCHORING

## with PAINE WOODSCREW ANCHORS

★ Available on LOW PRIORITY

For use in Tile • Marble • Slate  
Mosaic and Wood Furring

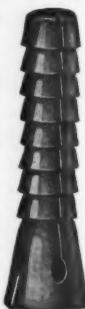


Fig. 950  
Lead Type

PAINE Woodcrew Anchors are the cheapest and best anchors available. You simply place anchor in hole, insert woodcrew and tighten. NO setting tool is needed. Anchor expands uniformly as screw is tightened to assure a firm fastening and a workmanlike job. Available on low priority in a wide variety of sizes.



Fig. 955  
Fiber Type

Ask your Supplier TODAY and Write for  
Catalog

THE PAINE CO. 2961 Carroll Ave., Chicago  
Offices in Principal Cities

★ **PAINE** ★  
FASTENING  
and HANGING DEVICES

**ILSCO**  
Electrical Connectors

Why  
ILSCO PRODUCTS

Are Best and

Easiest  
to Use

*IlSCO*  
APPROVED  
SINGLE HOLE  
SOLDERING  
LUGS



1. Seamless copper tubing is drawn down to size in our own plant.
2. No special tools required.
3. Wire size stamped on barrel of lugs.
4. Maximum contact surfaces.
5. Extra strength built in.
6. Can't leak solder.
7. Simple in construction.
8. Sound in design . . . . . and many other reasons proved in actual use throughout the nation.

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COUPON  
TODAY

Please rush us sample and  
32-page illustrated catalog.

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**ILSCO** COPPER TUBE  
& PRODUCTS, Inc.  
CINCINNATI, OHIO

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# Save MAN-HOURS.. Protect MAN-POWER

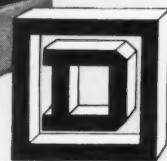
## WITH SQUARE D COMBINATION STARTERS



Model 2K vertical Milwaukee milling machine manufactured by Kearney & Trecker Corporation

Standard Square D safety switches serve as the motor circuit disconnect. Operation is quick make and break. Switch blades are visible for easy inspection. Switch can be operated for testing after cabinet door is opened.

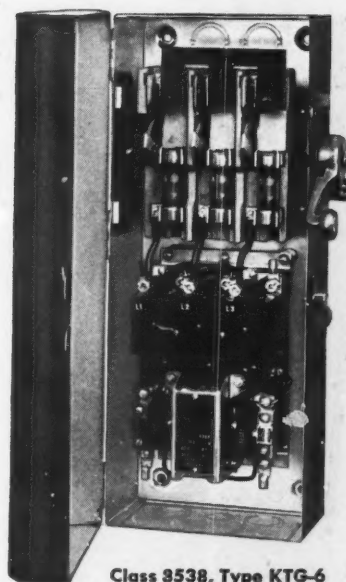
The Square D motor starter has straight line vertical action with double break, trouble-free silver contacts. All renewable parts, including magnet coil and contacts, can be inspected or replaced in a matter of seconds, using only a screwdriver and without disturbing connections or removing the starter from the cabinet.



With only one device to mount and wire, installation is simpler—takes less than half the time needed to mount separate units. Complete accessibility makes servicing a fast and simple routine.

Safety features protect man-power. Cover interlock makes it impossible to open the combination starter unless the disconnect switch is in the "OFF" position. Switch handle may be padlocked "OFF" for positive protection while machine is being adjusted or repaired.

Enclosure steel and wiring materials are conserved because switch and starter are mounted in one box and already wired together.



Class 3538, Type KTG-6 combination starter

### CALL IN A SQUARE D FIELD ENGINEER



If you have a problem which involves electrical distribution or control, call in the nearest Square D Field Engineer. Backing him up in every Square D plant, are design and engineering specialists with complete research and testing laboratories at their command. There are Field Engineers in Square D branch offices in 52 principal United States and Canadian cities.

## SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES  
KOLLMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK  
IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

# G-E WIRING MATERIALS DISTRIBUTORS

*Offer Maintenance Supplies*

**For War Project Wiring the Country Over**

See the G-E Wiring Materials Distributor in your territory to obtain wiring materials needed for wiring system maintenance jobs you are handling . . . for wiring conversion jobs and wiring additions . . . for new war project wiring. There are over 175 of these neighborly distributors in different parts of the country.

G-E Wiring Materials Distributors handle the full G-E high quality line, the largest on the market. This line includes conduits . . . boxes and fittings . . . wires and cables, bus-drop cable, BraidX . . . and wiring devices including Silvend fuses having silver-plated contacts.

A representative will be glad to call and help solve maintenance and new wiring problems. His long experience and knowledge of new wiring methods are sure to prove helpful. Take advantage of this close source of wiring supplies and of the friendly service offered.



G-E wiring materials district representative in all parts of the country help distributors serve customers. Here is H. C. Macubbin, who covers parts of New Jersey, Pennsylvania and Delaware.

## SEE YOUR G-E DISTRIBUTOR

The G-E Wiring Materials Distributor near you will be pleased to give information about G-E conduit, wire and cable and wiring devices for your needs. Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.



**GENERAL  ELECTRIC**



J. P. Bowers (left), manager, General Electric Supply Corporation, Jersey City, N. J., and J. C. Morris of the J. C. Morris Co., electrical contractors, are here discussing switches suitable for a job Mr. Morris is handling.



R. V. "Fatty" Heitzman (right), branch manager, General Electric Supply Corporation, Evansville, Ind., and Norman G. "Skinny" Knapp, branch operating manager, are checking materials needed by customer on urgent war job for immediate delivery.

Earl H. Evans (left), sales manager, General Electric Supply Corporation house, Appleton, Wis., and Clem G. Nabbefeld, service manager, are shown on way to confer with customer on wiring materials needed for rush war job.

